2024
Fiscal Year

Report

TO THE BOARD OF TRUSTEES ON

Council of Experts Activities

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Letter From the Chair

On behalf of the Council of Experts (CoE) and USP staff, I am pleased to present the fiscal year 2024 (FY24) CoE annual report. This is the fourth annual report of the 2020–2025 cycle, and it describes the activities and achievements of the CoE and its Expert Committees (ECs) and Expert Panels (EPs) in collaboration with the Global Science & Standards Divisional staff from July 2023 through June 2024.

Throughout FY24, USP has leveraged its resources to deliver impact through standards development, advocacy, and capability building, guided by the 2020–2025 Resolutions adopted by the USP Convention in May 2020. The following areas of focus have been particularly important in the context of our vision to be a definitive source of quality standards:

Strengthening the medicine supply chain

The global medicine supply chain was tested during the COVID-19 pandemic, and drug shortages continue to be a persistent problem in the United States, substantially affecting patient care. USP remains engaged in drug shortage prevention and mitigation efforts to help ensure patient access to quality medicines. USP standards and quality-focused solutions help improve access to safe, quality medicines people can trust. USP actively monitors the supply chain using tools such as USP's Medicine Supply Map, which uses artificial intelligence and predictive analytics to identify, characterize, and predict risk in the complex supply chain for manufacturing drug products and their ingredients. Our research has revealed that shortages are primarily driven by economic factors, underscoring the urgent need to address the market factors of this pervasive problem. USP's advocacy work focuses on enhancing supply chain resilience by diversifying manufacturing locations, sourcing alternative suppliers, and promoting transparency, thereby strengthening public health.

Supporting an environment of collaboration and transparency

The unprecedented pace at which transformative therapeutic modalities continue to accelerate underscores the need for key stakeholders and regulators to work together to protect public health and identify gaps in quality that could threaten the stability of the supply chain. At USP, our work recognizes the need for open dialogue and greater visibility into all aspects of the supply chain to improve supply chain resilience on a global scale, establish stable access to drugs, and create an industry environment for collaboration across borders to ensure that quality medicines are available to patients, right when they need them.

Accelerating innovation and expanding the supply of quality biologics

FY24 has witnessed remarkable growth in lifesaving medications, with biologic medicines at the forefront. To support the acceleration of innovation and expand the supply of quality biologics, USP provides materials and quality standards manufacturers can use to develop, validate, and monitor analytical methods for monoclonal antibodies, cell and gene therapies (CGTs), and biosimilars. Because many biologic modalities and associated manufacturing platforms face similar analytical challenges and use similar methodologies, USP's approach to standards development seeks to broaden their impact by defining a framework for quality that can be used across multiple biologics. By developing solutions to foster the advancement of quality biologics technologies and products, USP is dedicated to setting standards that play a pivotal role in advancing the biomedical industry with a focus on safety and quality.

FY24 was an exciting year of notable accomplishments and significant, positive changes.

I am pleased with how we are working together, increasingly in cross-functional teams, and functioning as a global hub to accomplish our overall objectives. Together, we have achieved important milestones; continued to expand our portfolio of quality standards and solutions through collaboration; made substantive progress in our commitment to diversity, equity, inclusion, and belonging (DEIB); and expanded our approach to environmental, social, and governance (ESG) to help foster a healthier, more sustainable world. Against this backdrop, USP's transition to the 2025–2030 cycle is in full swing. The Expert Volunteer Recruitment team has kicked off USP's Expert Volunteer Recruitment efforts (formerly known as the Call for Candidates). And we have developed more flexible approaches to how we engage our stakeholders while enhancing our efforts to reach the right stakeholders at the right time to create the most relevant standards and solutions.

We have achieved all of this thanks to the dedication, commitment, and perseverance of our global network of USP staff and Expert Volunteers, our strong relationship with the U.S. Food and Drug Administration (FDA) and other regulatory agencies, and insights obtained from our industry stakeholders worldwide. In this context, it is critical to access the best expertise and talent, and USP is committed to creating a culture where everyone feels empowered and valued and that they can contribute their full potential to accomplish our mission to help build quality foundations for a healthier world.

In this introduction, I want to highlight a few of our many FY24 activities and accomplishments, which are explained in detail in the pages that follow, and the key factors that have contributed to our successes.

1 USP accomplished a major milestone when the revised compounding chapters became official.

The revised *USP* General Chapters <795> *Pharmaceutical Compounding—Nonsterile Preparations* and <797> *Pharmaceutical Compounding—Sterile Preparations* became official in FY24. Both are available in *USP–NF* and through the *USP Compounding Compendium*. The revisions to <795> and <797> incorporate extensive stakeholder feedback and reflect advancements in science and practice that help ensure quality compounded preparations, promote public health, and protect patients and healthcare workers. USP has continued to develop resources in response to topics raised by stakeholders during the revision of <795> and <797>.

2 USP and FDA collaborated on support for compendial standards and monograph development.

After years of collaborative work with the Small Molecules group, U.S. Regulatory Affairs, and other USP staff, the FDA has added a Compendial Standards section to drug application approval letters to help ensure that drugs meet consistent standards for strength, quality, performance, and purity.

- **Compliance required:** A drug named in the official *USP–NF* generally must meet the specified standards for strength, quality, performance, and purity unless any variations are clearly indicated on the label, according to the Federal Food, Drug, and Cosmetic Act § 501(b), 21 USC 351(b).

- **Information sharing limits:** FDA cannot share specific application information with third parties, including USP.
- **Collaboration encouraged:** Drug application holders can work with USP to update official monographs in the *USP–NF* for continued compliance.

This language reflects FDA's commitment to maintaining quality standards, safeguarding public health, and providing a clear regulatory framework for the pharmaceutical industry.

3 Pharmacopeial Discussion Group (PDG) achieved landmark expansion.

The Indian Pharmacopoeia Commission (IPC) has officially joined the PDG as a member, marking the most significant expansion of the PDG's global membership since its founding in 1989 by the *European Pharmacopoeia* (*Ph. Eur.*), *Japanese Pharmacopoeia* (*JP*), and *USP*. USP–India, Hyderabad, hosted the PDG's Annual Meeting Oct. 3–4, 2023, as well as a stakeholder event Oct. 5, 2023, where PDG members and USP staff welcomed the IPC, following its successful completion of a year-long pilot for expanded membership. The PDG's milestone expansion is anticipated to strengthen PDG's ability to maintain a consistent level of science across the pharmacopeias and to help facilitate global harmonization of select pharmacopeial standards (including excipient monographs and select general chapters) with the shared goal of protecting public health. IPC's membership increases global access to PDG quality standards by approximately 1.3 billion people, including the Indian pharmaceutical industry, a major manufacturer of the world's medicines. The World Health Organization (WHO) continues to serve as a PDG observer.

4 ATCC and USP debuted products to advance quality and reduce risk in manufacturing biological therapies and vaccines.

In October 2023, USP and ATCC, a nonprofit global biological materials management and standards organization, launched their first set of joint products to advance the quality control and reduce the risk in manufacturing of biological therapies and vaccines. This initial set of six products can be used to measure residual host cell DNA in various biotherapeutic products as required by regulatory authorities. The new products complement USP's existing *USP* General Chapter <509> *Residual DNA Testing* and associated Reference Standards (RSs) and expands the scope of biological products supported by adding genomic DNA from six additional cell lines commonly used in bioproduction of vaccines, CGTs, and other protein therapeutics. The presence of residual DNA from the host cell is a concern in the development of biological therapies as it can pose a safety risk if it is not removed from the product.

5 USP proposed new *USP* General Chapter <86> *Bacterial Endotoxins Test Using Recombinant Reagents*.

The General Chapters–Microbiology EC has proposed new General Chapter <86> as an alternative to *USP* General Chapter <85> *Bacterial Endotoxins Test*. The proposed chapter introduces additional techniques for bacterial endotoxin testing using nonanimal-derived reagents such as recombinant Factor C and recombinant cascade reagents. The proposal was published in *Pharmacopeial Forum* (*PF*) 49(6) [Nov.–Dec. 2023] and posted through a General Announcement. Based on comments, the text has been revised to refine the proposed chapter for ballot.

6 USP expanded its approach to ESG considerations.

Fulfilling our mission to improve public health through quality standards and related programs can also help address pressing social and environmental challenges. In FY24, USP expanded its approach to embedding key ESG considerations across its operations. This effort included creating an ESG executive-level committee and multiple work groups across our organization focused on advancing related operational objectives. It also included working with external consultants to assemble baseline data on greenhouse gas emissions and energy use, materials consumption, waste management, and water use in USP

operations. These actions will facilitate related ESG target setting, impact measurement, and information sharing while setting the stage for further development and implementation of USP's approach to ESG considerations to help foster a healthier, more sustainable world.

7 USP launched the DEIB EP of the CoE.

The Chief Science Officer led a cross-functional team of Science, Equity Office, and Legal Strategy & People staff that helped select Giovan Lane as Chair of the DEIB EP, which reports to the CoE. The EP advises Expert Volunteer leadership and USP staff on best practices to establish a diverse and inclusive environment that fosters strong performance and collaboration. Other responsibilities include 1) helping to implement the USP Health Equity Guiding Principles in the standards development process and establishing measurable outcomes of USP's public health impact, 2) reviewing and supporting the implementation of USP's DEIB curriculum across the ECs and EPs, and 3) contributing to Expert Volunteer Recruitment efforts.

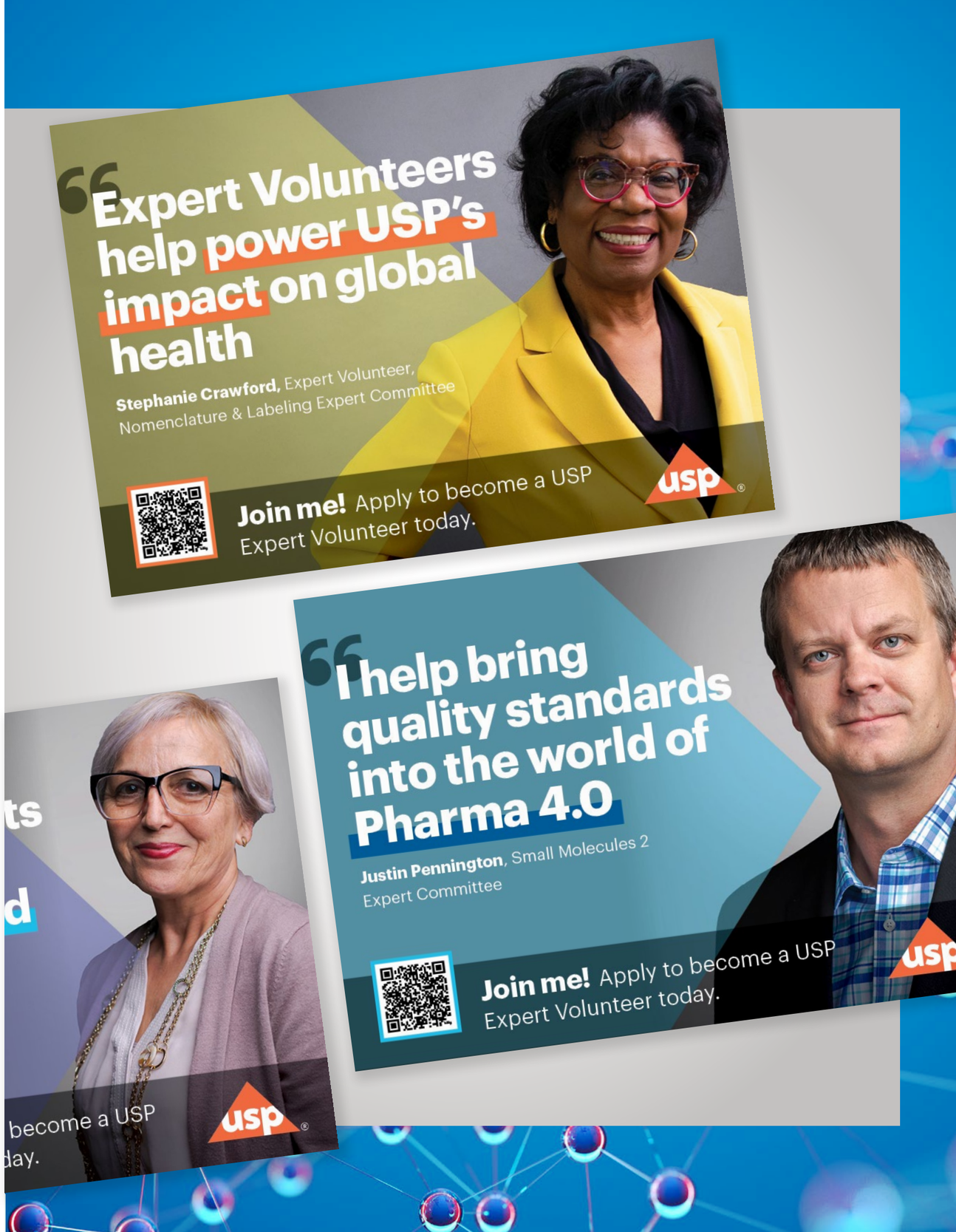
8 USP began preparations for the next cycle and launched Expert Volunteer Recruitment.

USP's 2025–2030 cycle transition and Expert Volunteer Recruitment efforts kicked off in FY24:

- The draft proposal for the numbers and types of ECs for the next cycle was endorsed by the Board of Trustees (BoT) and provided to the Convention Membership for comments. The CoE reviewed the comments and moved the proposal forward to the BoT, which approved the proposal with no changes in June 2024.
- The slate of 15 members of the Nominating Committee for the CoE (NC CoE) were appointed in June 2024. The charge of the NC CoE, as outlined in Article XI of the USP *Bylaws*, is to solicit, review, and provide to the Convention Membership a slate of candidates to chair the ECs for the next cycle. The Chairs will be elected at the May 2025 Convention meeting and will collectively serve as the 2025–2030 CoE.
- The Expert Volunteer Recruitment team has kicked off USP's Expert Volunteer Recruitment efforts. The team has launched USP's "Become a USP Expert Volunteer" webpage, which features a new "Apply now" button that enables applicants to register their interest in applying to be an Expert Volunteer.

I am sincerely grateful to everyone who helped accomplish these impressive achievements. In particular, I would like to highlight the work of our Expert Volunteers, who tirelessly dedicate their own time to support USP's global mission to help build quality foundations for a healthier world. Indeed, our impact in FY24 was made possible by the numerous hours—estimated at 88,322—that were generously contributed by our Expert Volunteers and augmented by our dedicated staff. I invite you to read the following pages, which tell the stories of how our collaborative activities in FY24 have benefited consumers, patients, and other global stakeholders by helping to improve and protect public health in the United States and around the world.

Jaap Venema, Ph.D.
USP Chief Science Officer & Chair,
USP Council of Experts



Fostering Collaboration: FY24 at a Glance

CoE Overview: The CoE, consisting of the 29 EC Chairs plus USP's Chief Science Officer, who serves as CoE Chair, is one of USP's three governing bodies. Its members direct the scientific standards-setting initiatives for the organization and ensure that these efforts align with USP's Resolutions, policies, and strategies. The CoE oversaw the activities of numerous global scientific Expert Volunteers who served on ECs, EPs, and Joint Standards-Setting Subcommittees (JS3s) in FY24.

USP Standards Approved in FY24

Expert Volunteers play a vital role in providing expertise and in the development of standards by participating in Expert Body discussions and reviewing documents and information. EC members approve USP Documentary Standards (DSs) for publication and Reference Standards (RSs) for release. They ballot on all regular DS revisions, new RSs (F Lots), and a sampling of Replacement and Continuation (R&C) Lots.

Pharmaceutical Analytical Impurities (PAIs)

Manufacturers can use USP PAIs in analytical testing to detect, identify, and measure impurities. USP PAIs are released through a quality process designed to ensure identity and quality for analytical applications. PAI products are different from official USP RSs, but together they can help provide comprehensive solutions for research and analytical needs across the drug life cycle. Their use can help control impurities to consistently produce safe and effective products so patients have access to quality medicines.

Analytical Reference Materials (ARMs)

ARMs are characterized substances with accompanying data that help provide comprehensive solutions for research and analytical testing needs when USP RSs are not applicable. ARMs are used at various stages of a drug's life cycle for analytical testing and research and for testing raw materials, lab equipment, and other components used in pharmaceutical, food, and supplement work.

USP Governing Bodies and Related Groups

Board of Trustees (BoT)

14 members,
including 10 members elected by the USP Convention, three at-large members appointed by the BoT, and the USP CEO (ex officio, nonvoting), responsible for USP's:

- Policy oversight
- Fiduciary obligations
- Strategic direction
- Sustainability

USP Convention Membership and Council of the Convention (CoC)

454 organizations
compose the Convention Membership, invited by the BoT based on recommendations of the CoC, responsible for:

- Providing input to USP throughout each cycle, informing work, and advancing mission
- Adoption of Resolutions that guide USP priorities and initiatives
- Adoption of amendments to the USP *Bylaws*
- Election of Officers, Trustees, and CoE

The CoC guides meaningful engagement of the Convention and represents the membership in important governance decisions.

CoE

29 Chairs
of USP ECs, elected by the USP Convention, plus USP's Chief Science Officer, who serves as CoE Chair, responsible for:

- USP scientific and standards-setting decisions
- Standards-setting work of USP's Expert Bodies
- Adherence to the direction set forth by the BoT and USP Convention

Expert Bodies Under the CoE

ECs
Scientific experts who create, revise, review, and approve standards for a specific topic area. EC members are elected by the CoE and serve a 5-year term.

EPs
Advisory bodies formed to supplement EC expertise on specific topics. Each has a specific charge and is dissolved upon completion of its work. Members may include EC members and may serve on multiple EPs.

JS3s
Representatives from ECs who serve on subcommittees formed to address issues that affect multiple standards-setting areas.

USP Staff: Individuals who support and shepherd the work of all governing bodies and related groups

FY24 Balloted and Approved Standards, by the Numbers

81 DS Ballots	**265** DS Items Balloted
236 New or Revised DSs Approved	**86** Modernized DSs Approved
29 *USP–NF, Food Chemicals Codex* (*FCC*), and Supplements DSs Omitted	**333** RS R&C Lots Released
112 RS F Lots Released	

PAIs

268 New Products in FY24	**34** Replacement Lots in FY24	**629** Total Products in the PAI Catalog

ARMs

33 New Products in FY24	**0** Replacement Lots in FY24	**33** Total Products

CoE Key Activities and Accomplishments

FY24 Highlights

The CoE met nine times during FY24. In addition to leading and managing the work of ECs, CoE members drive USP's bold strategic direction for science, facilitate robust scientific dialogue, evaluate public input on USP standards, uphold and champion policies and practices that ensure the integrity of the standards-setting process, and help identify and mentor the next generation of USP Expert Volunteers. The following are highlights of the CoE's key activities and accomplishments during FY24, guided by the organizational goals defined by the 2020–2025 Convention Resolutions.

Forwarding the 2025–2030 CoE Structure Proposal

CoE members reviewed the Convention Membership comments on the proposed number and types of ECs for the next cycle at the June 20, 2024, CoE meeting and moved the proposal forward to the BoT for approval. The BoT approved the proposal at its June 26, 2024, meeting.

Proposing Changes to the 2025–2030 *CoE Rules* and *Procedures* and USP *Bylaws*

The CoE and USP staff collaborated on proposed changes to the *CoE Rules and Procedures* for the next cycle at its May 30, 2024, CoE meeting. The *Rules* will undergo an approval process through FY26 that includes provisional adoption by the CoE, review by the Council of the Convention (CoC), a comment period for Convention Members, and final approval by the BoT. Additionally, the CoE deliberated on the draft proposed amendments to the USP *Bylaws* that would pertain to the CoE and ECs at the Feb. 15, 2024, CoE meeting. CoE input was taken to the CoC for consideration. The CoC will determine the *Bylaws* amendments that will be presented to the full Convention Membership for voting at the May 2025 Convention meeting.

Collaborating with the DEIB Expert Panel (EP)

CoE members collaborated with USP staff and Giovan Lane, Chair of the DEIB EP, on ways to implement USP's DEIB strategy and Health Equity Advisory Group's guiding principles at the May 30, 2024, CoE meeting. The DEIB EP, which reports to the CoE, comprises 13 members who are each aligned with at least one of USP's Collaborative Groups to support USP's DEIB strategy. Among its key responsibilities, the DEIB EP will help implement the Health Equity Guiding Principles within the standards development process to advance USP's public health impact. During the meeting, attendees discussed developing metrics for incorporating USP's DEIB strategy and Health Equity Advisory Group's guiding principles into the CoE's daily work and deliberated on recruiting a diverse pool of qualified candidates for the 2025–2030 cycle.

Strategic Planning for the New Cycle

The second USP Volunteer Leadership Meeting (VLM) of the 2020–2025 cycle, held as a hybrid event Oct. 11–13, 2023, in Washington, DC, brought together USP's three Volunteer Leadership Bodies—the BoT, CoE, and Council of the Convention—to celebrate USP's current accomplishments, provide input on progress and plans, and collaborate on key leadership initiatives and our future impact together in the upcoming 2025–2030 cycle. VLM attendees deliberated on the following proposed strategic priorities for the new cycle:

1. Enable greater availability of the world's most relied-upon medicines.
2. Solve pervasive quality challenges that impact medicines, supplements, and foods.
3. Strengthen resilience of the global pharmaceutical supply chain.
4. Expand global availability of and access to quality-assured biologics products.
5. Advance quality through the increased use of digital technologies.
6. Foster environmental sustainability across the pharmaceutical life cycle.

We are committed to expanding opportunities for Expert Volunteers to engage in cross-functional experiences.

VLM Impact Stories

A cadre of EC Chairs eloquently described concrete examples of their Expert Bodies' activities addressing a wide range of patient and public health needs. Their impact stories included descriptions of challenges related to the infant formula supply chain, high-risk excipients, and expiration date formats as well as accounts of work related to radiopharmaceutical and imaging drug substances and drug products, USP's environmental impact strategy, and standards that could help the development of advanced therapies.

USP Science Volunteer Awards

USP presented the following Expert Volunteer awards at the VLM in recognition of the recipients' achievements and impact on global public health by developing relevant quality standards:

2023 USP Jacob Bigelow Awardees:

- Tieraona Low Dog, M.D., recognized for 25 years of service on multiple USP Expert Bodies supporting our work on dietary supplement and botanicals standards.
- Anthony Bevilacqua, Ph.D., for service spanning more than 2 decades volunteering on multiple USP Expert Bodies supporting our work on water for pharmaceutical and analytical purposes standards.
- Brenda Jensen, M.A., recognized for her service as Chair of the Compounding EC for advancing global compounding standards and best practices.

2023 Expert Volunteer Body Awardees:

- Drug Classification Subcommittee recognized for its dedication to prioritizing medication access, affordability, and health equity across its collective work on drug standards, classification, and placements.
- Cannabis EP recognized for its standards-setting activities vital to prevent harm, improve medical cannabis product safety, and promote reproducible research on cannabis.
- Complex Excipients EC recognized for navigating today's complex landscape of excipients quality and ensuring only quality ingredients are used in manufacturing drugs.

USP Aegis Awardee:

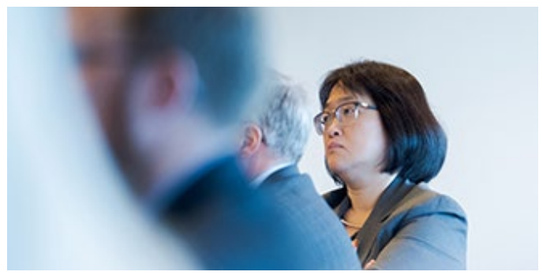
- Todd K. Abraham, Ph.D., M.B.A., recognized for his steadfast efforts as a USP BoT Member to build trust in the world's supply of medicines, dietary supplements, and foods.

USP President's Awardee:

- Hanan Sboul, M.B.A, B.Pharm., recognized for her extraordinary commitment as a USP Council of the Convention Member to help protect patient safety and strengthen the global supply of quality medicines.

Enhancing the Expert Volunteer Experience

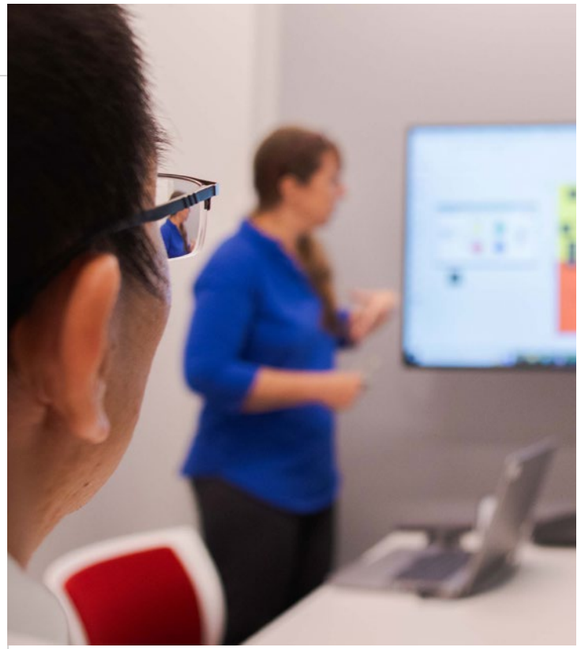
As part of the strategic planning for the 2025–2030 cycle, we are committed to expanding opportunities for Expert Volunteers to engage in cross-functional experiences. Toward those ends, the CoE and USP staff began collaborating on a refreshed approach for how Expert Volunteers experience their involvement with USP at the Aug. 31, 2023, CoE meeting. The CoE and USP staff explored key themes from CoE survey data and breakout sessions to identify elements that enrich engagement and contribute to quality standards-setting at USP. Building on this, the CoE and USP staff continued their collaboration during the March 21, 2024, meeting, focusing on workstreams aimed at improving the volunteer experience, particularly in onboarding and ongoing engagement.



General Notices and Requirements (GNs) Proposed Revisions

CoE members reviewed the commentary on proposed revisions to *GN*s published in *PF* 50(2) [Mar.–Apr. 2024] and moved the proposal to ballot with minor changes based on comments received at its June 20, 2024, meeting. The proposal includes the following:

- Proposed revisions of *GNs Section 5.80 USP Reference Standards*, enabling the use of USP Reference Standards in future digital applications. The CoE advanced this proposal to *PF*.
- Proposed revisions of *GNs Section 3.10 Applicability of Standards*, which are intended to avoid the perception that all text after the title Definition in a monograph is a requirement. The CoE advanced this proposal to *PF* at its Oct. 12, 2023, meeting.
- Proposed revisions of *GNs Section 5.60 Impurities and Foreign Substances*, which would remove reference to Other Impurities, include references to International Council for Harmonisation (ICH) M7, update subsection titles and references, and clarify the requirements. The CoE advanced this proposal to *PF* at its Oct. 12, 2023, meeting.
- Proposed new *GNs Section 5.15 Definition*, which describes the *Definition* section in monographs and specifies what statements in the *Definition* section are requirements. The CoE advanced this proposal to *PF* at its Oct. 12, 2023, meeting.

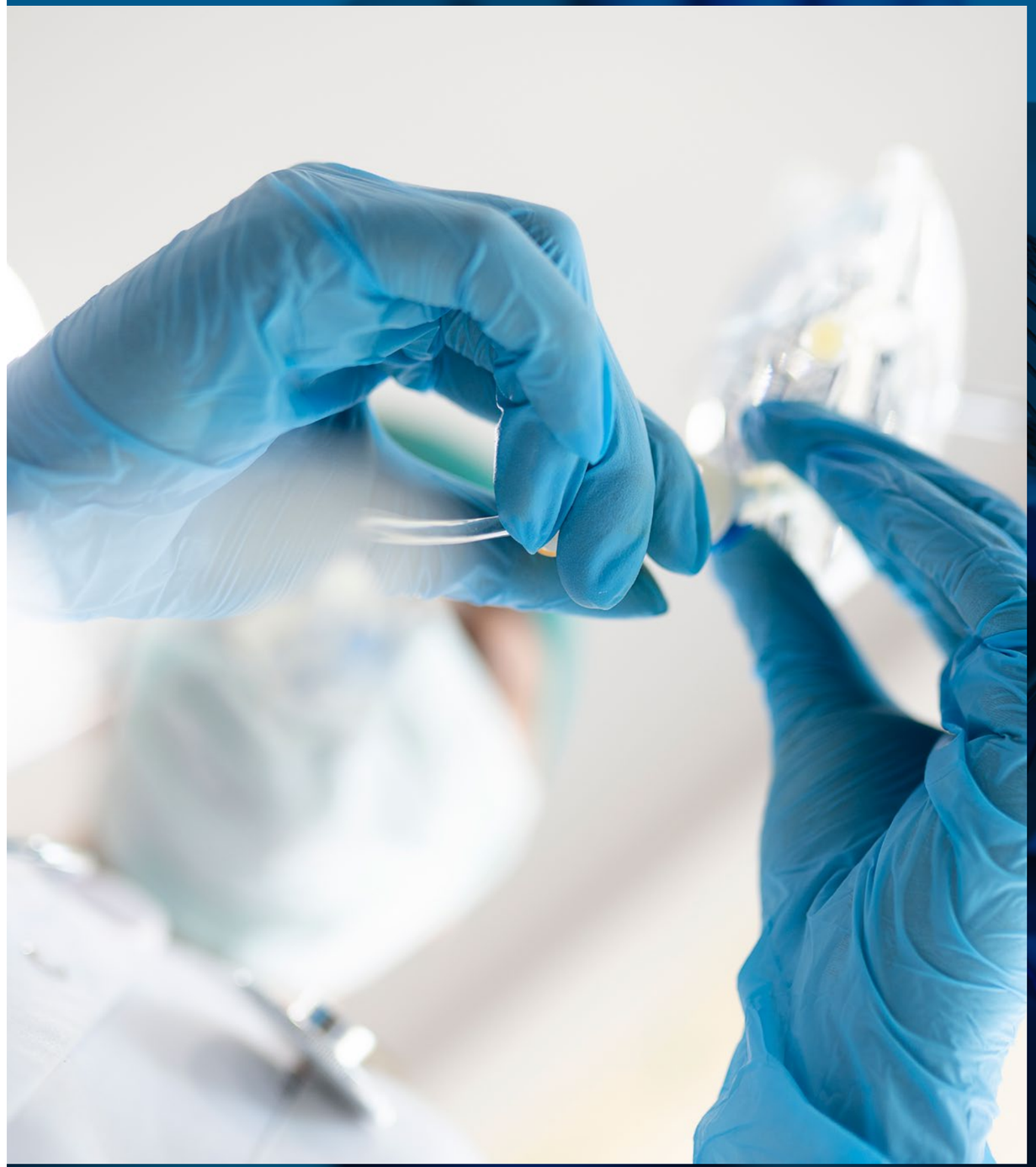


Proposing Inclusion of Digital Standards in *USP–NF*

Members of the CoE collaborated with USP staff in the Inclusion of Digital Standards Working Group, which has been working on the development, inclusion, and acceptance of USP Digital Reference Standards into the Compendia, including the development of draft proposals for the corresponding revisions to the Compendia. At the CoE meeting on Nov. 16, 2023, the CoE voted to advance the proposed revision of *USP* General Chapter <11> *USP Reference Standards* to publication in *PF* 50(3) [May–Jun. 2024] for public comment, which closed on July 31, 2024.

Collaborating on Personalized Medicine and Digital Therapeutics (DTx)

The CoE provided feedback to USP staff on the Healthcare Quality and Safety (HQS) group's vision and strategic approach to new standards-setting activities for personalized medicine at the March 21, 2024, CoE meeting. The HQS's science-based road map for personalized medicine is anticipated to initially focus on standards to support the implementation of pharmacogenomics testing and utilization of DTx in healthcare delivery. The standards are anticipated to cover broad areas such as nomenclature, labeling, establishing industry-recognized parameters for quality, and describing implementation models of care.



Diversity, Equity, Inclusion, and Belonging (DEIB)

FY24 Highlights

We continue to advocate for DEIB, which is central to our public health mission and makes USP stronger as an organization. Our science vision is steadfastly focused on driving global convergence of quality standards for a future with safe and equal access to quality medicines, foods, and dietary supplements and improved health regardless of race, gender, belief, or geographic, economic, or socioeconomic factors. The following activities are in alignment with Resolution VII, on education and training for industry and healthcare professionals; Resolution XIV, on culture of excellence; and Resolution XV, on impact expansion.

USP's Office of Organizational Culture, Equity and Inclusive Excellence (Equity Office), headed by Debra Joy Pérez, Ph.D., Chief Equity Officer and Senior Advisor to the CEO, helps shape and implement USP's DEIB efforts by actively collaborating with Global People and Culture functions and other partners across the organization. Key DEIB activities in FY24 included the following:

Collaborating on Expert Volunteer Recruitment

The Equity Office has partnered with Documentary Standards and Compendial Policy to help attract robust, diverse, and highly qualified Expert Volunteer candidates for the 2025–2030 cycle. As part of this effort, the Equity Office has continued to 1) hold Interrupting Implicit Bias trainings for key stakeholders involved in Expert Volunteer Recruitment processes, 2) meet with USP Affinity Groups to strategically leverage their expansive networks for greater Expert Volunteer diversity, 3) engage with outside networks and associations that support historically underrepresented communities, and 4) consolidate outreach efforts in close collaboration with USP Global External Affairs and Communications team members.

Launching the DEIB Expert Panel (EP)

The Chief Science Officer led a cross-functional team of Science, Equity Office, and Legal Strategy & People staff, which selected Giovan Lane as Chair of the DEIB EP, which reports to the CoE. Launched in FY24 Q4, the DEIB EP comprises 13 members who are each aligned with at least one of USP's Collaborative Groups to help operationalize USP's DEIB strategy. The DEIB EP will advise Expert Volunteer leadership and USP staff on best practices to establish a diverse and inclusive environment that fosters strong collaboration. Other responsibilities include 1) helping to implement the USP Health Equity Guiding Principles in the standards development process and establishing measurable outcomes of USP's public health impact, 2) reviewing and supporting the implementation of USP's DEIB curriculum across the ECs and EPs, and 3) contributing to Expert Volunteer Recruitment efforts.

Progress on the DEIB Professional Development for Expert Volunteers Curriculum

The DEIB Professional Development for Volunteers curriculum was drafted and received feedback from key stakeholders. The curriculum is anticipated to be shared with the next cohort of Expert Volunteers as part of their onboarding experience.

Empowering Allies to Women in Science

The Equity Office completed the Male Scientist Allyship pilot at USP–India in FY24. The pilot program equipped male scientists with an awareness of the unique challenges faced by women in science, a mindset to intervene in those challenges, and the tools to act as allies against gender bias.

Ambassadors of Inclusion and Belonging

The Ambassadors of Inclusion and Belonging (AIBs) consult with their division members on the successes and challenges of integrating DEIB principles in USP's daily work. The AIBs have engaged in professional development trainings focused on behaviors of inclusion and building trust in the workplace, learned new strategies to share with their teams, and shared updates with the Equity Office. In FY24, AIBs provided important insights regarding how DEIB is operationalized at USP.

Peer Learning Network 2024

This leadership development program focuses on inclusive management, enabling participants to experience different perspectives, develop new behaviors, and begin to make small changes necessary to effect change in the workplace. More than 70% of the 104 people managers from all USP divisions and six countries who registered for the course completed the 12-week program and graduated in May 2024.

Training in Psychological Safety, Speak Up Culture, and Inclusive Leadership

The Equity Office and USP Global External Affairs have held a series of trainings on psychological safety, building a Speak Up culture, and inclusive leadership. These interactive trainings encourage participants to share their insights in breakout sessions and engage in report-outs.

Organizing LGBTQ+ Equity Challenge and Pride Month Events

On April 22, 2024, the Equity Office and eQuality Alliance affinity group invited all USP staff to participate in the LGBTQ+ Equity Challenge, a platform for constructive dialogue, education, and actionable change. Additionally, in June 2024, the eQuality Alliance held a flag-raising event to kick off Pride Month at USP, and the Equity Office organized a Pride Month quiz focused on LGBTQ+ history, culture, and transgender inclusion to help deepen employees' understanding and foster a more inclusive workplace.

DEIB is central to our public health mission.

Global Science and Standards Division

FY24 Highlights

The Global Science and Standards Division (GSSD) comprises Documentary Standards and Compendial Policy, Global Lab and Technical Operations, Global Biologics, Scientific Affairs, and associated groups. Its scientific vision is for USP to become more iterative in creating standards and disseminating knowledge, a thought leader in the science of quality, and the definitive source of quality standards. The GSSD's Scientific Affairs team serves as a global impact amplifier by engaging the scientific community and supporting key USP activities.

The GSSD activities summarized here have been guided by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution III, on quality standards; Resolution IV, on access to biologics; Resolution V, on innovations; Resolution XII, on evidence generation to inform policy; Resolution VIII, on regulatory systems strengthening; and Resolution XIV, on culture of excellence. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; Resolution XII, on evidence generation to inform policy; Resolution XIII, on coalition building; and Resolution XV, on impact expansion. FY24 highlights included the following:

Strategic Collaboration to Address Critical Drug Shortages

On Feb. 13, 2024, USP announced a strategic collaboration with the API Innovation Center to explore solutions to medicine supply chain challenges and critical drug shortages. The initial focus of the work has been on cancer medicines in short supply. As part of the collaboration, the Advanced Manufacturing Technologies (AMT) team in the Global Health and Manufacturing Services division will support the development and deployment of advanced manufacturing technologies used in continuous manufacturing, advanced analytical technologies, and methods to help strengthen local manufacturing capabilities for quality medicines. In May 2024, the AMT team met with the FDA to discuss how this collaboration will function and can be a resource in addition to USP's official standards-setting activities. Read USP's recent policy paper for key insights on adopting AMT for medical products.

USP Continuous Manufacturing Knowledge Center (CMKC)

On July 11, 2023, USP launched the CMKC in collaboration with the National Institute for Pharmaceutical Technology and Education (NIPTE), supported in part by funding awarded to NIPTE by the FDA. The online platform is intended to help address potential knowledge gaps by providing stakeholders with rapid access to the latest information and to help identify and address barriers to adoption of pharmaceutical continuous manufacturing (PCM). This past year, the AMT team grew the user base to more than 600 individuals from across the industry. On May 8, 2024, USP announced the formation of the CMKC Advisory Board who volunteer their time to ensure the continuous manufacturing community continues to grow and solve tough challenges to adoption of CM. Visit the CMKC webpage for more information.

USP Technical Guide on PCM

In August 2023, USP launched a technical guide on control strategies for continuous manufacturing of solid oral dose drugs. The guide, while not an official USP standard, is the first in a series aimed at providing detailed conceptual and practical illustrations of several aspects of PCM implementation. Visit the USP PCM technical guide webpage for more information. Also, in FY24, USP developed technical guides on process modeling and dissolution modeling for PCM that are anticipated to be published in FY25.

FDA Grant on Assessment of the Multi-Attribute Method (MAM) Versus Conventional Analytical Methods

USP advanced its work on MAM in an FDA-funded research project under the FDA Biosimilar User Fee Act (BsUFA) Regulatory Science Pilot Program. The objective of this work is to assess the performance of mass spectrometry–based MAM versus conventional QC methods to identify differences in product quality attributes and to correlate physiochemical differences with bioactivity, binding affinity, and structure. USP has completed characterization using conventional methods and MAM and is in the process of evaluating function and structure. USP presented early results at an FDA-sponsored webinar in October 2023 on the BsUFA III Regulatory Science Pilot Program and will present at several conferences in the fall of 2024. Results of this study will help support transitioning from conventional techniques to MAM by creating a knowledge base and roadmap that can lower barriers to adoption and enable wider use of MAM.

USP Makes Free Resources Available to Expand Drug Manufacturing in Africa

To support increased access to quality medicines and vaccines in Africa, USP is making available, free of charge, *USP–NF* and the USP Education training library to stakeholders within the African pharmaceutical ecosystem. Scientific quality standards—applied across the supply chain by a skilled workforce—are an important enabler for Africa's growing pharmaceutical sector and key to building trust and confidence in African-produced medical products. For more than 30 years, USP has collaborated with stakeholders in Africa to expand access to quality-assured medical products. Read the news release for more information.

Apheleia Second Minimally Viable Product (MVP2) Launched

In FY24 Q3, a major milestone was accomplished with the release of the Apheleia MVP2 business process management platform to support USP Documentary Standards (DSs) work (e.g., errata, accelerated revisions, forum proposals, other revision types) and most Reference Standards (RSs) test protocols. The Publications department has utilized this new system to publish several monthly publications and three issues of *PF*.

Publications Department Highlights

Leveraging Artificial Intelligence (AI)

The Publications department has developed an AI and technology action plan and has created a task force to explore leveraging AI for tasks such as automating tag and link reference checks in online content, enhancing automation in Word-to-XML file conversion, and exploring creation of a Spanish-language chatbot to triage customers' queries. Individual AI initiatives are scheduled and tracked via Jira tickets, and, as part of each effort, processes will be designed to measure and report efficiency gains.

Launched French *USP–NF* Project

In FY24 Q2, the Translation team launched the French *USP–NF* project, strategically aligned with USP's Africa initiative, to translate *USP–NF* content into French. Content selection is strategically aligned with USP's initiative for making available, free of charge, the *USP–NF* and the USP Education training library to stakeholders within the African pharmaceutical ecosystem to help increase access to quality medicines and vaccines in Africa. In FY24, the French *USP–NF* project developed a translation model, onboarded new tools and translation methodologies, and formed a French Working Group to scientifically validate terminology.

Additionally, the Translation team's mission is to translate USP DSs and other scientific content into Spanish and to provide support to Spanish-speaking users and other USP departments. Highlights of the Translation team's activities during FY24 included the following:

- Provided translation support for the Spanish Translation EP's work related to 105 titles for new *USP–NF* chapters, monographs, and reagents, as well as glossaries for 19 monographs or general chapters.
- Translated and provided scientific review of 438 documents related to *USP–NF 2023 Issue 3, USP–NF 2024 Issues 1 and 2,* and Accelerated Revisions.
- Translated and reviewed 66 communication and training materials (e.g., webpages, USP Education course captions).
- Published three issues of the Spanish *USP–NF/PF* Newsletter.
- Responded to more than 1,100 customer and stakeholder queries in Spanish.

Scientific Affairs & Strategy Team Highlights

Increased Engagement in USP Knowledge Hub Online Community Pilots

The Scientific Affairs & Strategy team played a key role in increasing early scientific engagement in USP Knowledge Hubs' online community pilots. During FY24, the Nitrosamines Exchange community increased membership by 40%, reaching 4,718 members, primarily from India, the United States, Mexico, Brazil, China, Egypt, and Germany. Member engagement, measured by visits, increased by a significant 60% for some 39,600 sessions.

Launched the Quantitative Nuclear Magnetic Resonance (qNMR) Knowledge Hub

The qNMR Knowledge Hub officially launched in December 2023 at the 3rd USP qNMR Symposium in Shanghai, China. Since then, more than 70 members have registered for the qNMR Knowledge Hub, with over 17,000 page views recorded. The topics of interest included quantum mechanical analysis, method optimizations, and cost effectiveness of NMR applications. A resource hub for complimentary qNMR courses, recordings of webinars, and workshops from past USP-hosted qNMR events has been created in the qNMR Knowledge Hub to facilitate knowledge sharing.

The Regional Scientific Advisory Panel (RSAP)

RSAP, which includes seven key leaders from industry and academia, has identified two topics for further exploration: alternatives to animal testing, and training and educational requirements for manufacturers, regulators, and students. The Scientific Affairs & Strategy team launched RSAP in Goa, India, last year to help USP understand and address the needs and concerns of regional stakeholders and develop and promote standards that are relevant and beneficial to the biopharmaceutical industry.

Scaling Scientific Engagement

The Scientific Affairs & Strategy team engaged more than 10,000 global stakeholders on key USP priorities through more than 100 events in FY24. Key topics included nitrosamines, analytical quality by design (AQbD), RSs, monoclonal antibodies (mAbs), vaccines, CGTs, impurities, dissolution, cannabis, and qNMR. Additionally, the team focused on scientific engagement with regional regulatory authorities to support the External Affairs team through more than 20 outreach events, including the following:

- "USP Therapeutic Antibody Drugs Workshop on Quality & Analysis Technologies" April 17–18, 2024, in Shanghai, China. Some 97 participants from industry, regulatory, and government attended this in-person event.
- "USP Workshop on Analytical Procedure Lifecycle and AQbD: ICH Q14/Q2(R2) & Compendial Approaches" April 15, 2024. Some 111 individuals from industry, regulatory, and government participated.
- "USP International Nitrosamines Summit" for regulators of Latin American countries March 19–20, 2024, with more than 80 attendees. The summit was followed by a USP Industry Forum March 21, 2024, in Mexico with some 100 participants representing industry, regulatory agencies, and academia at this in-person event.
- "2nd Workshop on Biologicals and Biosimilars" co-sponsored with Anvisa and Sindusfarma Dec. 12–13, 2023, in Rio de Janeiro, Brazil. More than 200 industry and regulatory representatives attended this hybrid event.

Advancing standards and solutions for quality medicines

- "3rd USP qNMR Symposium" Dec. 11, 2023, in Shanghai, China. More than 80 participants from industry, regulatory, and academia attended this in-person event.
- "2023 NIFDS-PMDA-USP Workshop for Advanced Therapies" by USP with the Republic of Korea's National Institute of Food and Drug Safety Evaluation (NIFDS) and Japan's Pharmaceuticals and Medical Devices Agency (PMDA) Nov. 30–Dec. 1, 2023, in Seoul, South Korea. Some 283 participants representing industry, regulatory agencies, and academia attended this hybrid event.
- "Asia-Pacific (APAC) Region Impurities Roadshow" Oct. 30–Nov. 10, 2023, in six countries. More than 390 industry, regulatory, and academia representatives attended this in-person event.
- "Value of Reference Standards" webinar by USP and

European Directorate for the Quality of Medicines & HealthCare (EDQM) Oct. 10, 2023. More than 970 industry, regulatory, and academia representatives registered for this virtual event.

- "International Symposium on Pharmaceutical Impurity Control 2023" scientific meeting on nitrosamines with China's National Institutes for Food and Drug Control Sept. 26–27, 2023. Some 105 participants representing industry, academia, and regulatory agencies attended this in-person event.
- "FEUM-USP 2023 Scientific Meeting" Sept. 21–22, 2023, in Mexico City. More than 120 industry, regulatory, and Farmacopea de los Estados Unidos Mexicanos (FEUM) representatives attended this hybrid event.
- Served as speakers, presenters, or panelists at more than 150 stakeholder events.

Scientific Exchange Program and Fellowships

Scientists from the global regulatory and pharmacopeial communities participated in USP's Scientific Exchange Program, which is designed to advance the development of scientists committed to pharmacopeial work and foster international recognition and harmonization of USP standards to help ensure the quality, safety, and benefit of medicines and foods. The following individuals participated in the FY23–FY24 Scientific Exchange Program:

- Shaima Abdulilah Kutbi, MSc., concluded her research with the Novel Excipients EP updating *USP* General Chapter <1074> *Excipient Biological Safety Evaluation Guidelines* to align with FDA and IPEC guidelines.
- Wala Turkistani concluded her work with the Biologics Monographs 5–Advanced Therapies EC writing an article that summarizes challenges in genome editing.

Additionally, Alejandro Yopasá Arenas, Ph.D., continued his fellowship at USP as part of a collaborative project between USP and the State University of Campinas in São Paulo, Brazil, focused on implementing AQbD principles outlined in *USP* General Chapter <1220> *Analytical Procedure Life Cycle*.

GSSD's Select Published Papers

- "Mitigating Matrix Effects for LC-MS/MS Quantification of Nitrosamine Impurities in Rifampin and Rifapentine," published Feb. 24, 2024, in *Journal of Pharmaceutical and Biomedical Analysis Open*.
- "Questions and Answers February 2024," published February 2024, in *Dissolution Technologies*.
- "Revisiting the Landscape of Potential Small and Drug Substance Related Nitrosamines in Pharmaceuticals," published December 2023, in the *Journal of Pharmaceutical Sciences*.
- "A new stability-indicating HPLC-UV method for determination of amlodipine besylate and its impurities in drug substance," published Sept. 1, 2023, in *Heliyon*.
- "Advancements and knowledge gaps in ICH Q2(R2)," published May 15, 2024, in *European Pharmaceutical Review*.
- "Ongoing Analytical Procedure Performance Verification Using a Risk-Based Approach to Determine Performance Monitoring Requirements," published Jan. 8, 2024, in *Analytical Chemistry*.

USP–India, Hyderabad

FY24 Highlights

USP–India supports USP's global standards-setting efforts and pursues collaborative opportunities with policymakers, regulators, professional and manufacturing associations, and leaders in India's pharmaceutical and food sectors.

USP–India's activities summarized here have been guided by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution III, on quality standards; Resolution IV, on access to biologics; Resolution V, on innovations; Resolution VI, on digital transformation of standards; and Resolution XI, on pharmacopeial cooperation and convergence. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion. USP–India staff supported key USP activities in FY24, including the following:

USP Tools for Understanding and Controlling Nitrosamine Impurities

USP–India's work providing advanced tools and solutions for testing, assessing risk, and understanding potential sources related to nitrosamine impurities has accomplished the following:

- Validated the mass spectrometry (LC-MS/MS)–based method for simultaneously determining 15 small nitrosamine impurities in losartan potassium, candesartan cilexetil, olmesartan medoxomil, telmisartan, and irbesartan drug substances. The method was extended to sartan drug products, and validation was completed for valsartan and irbesartan drug products. This method will help industry conduct early screening of its active pharmaceutical ingredients (API) and faster risk assessment of its process for the presence of small nitrosamines.
- Delivered 35 nitrosamine Pharmaceutical Analytical Impurities (PAIs), including several nitrosamine drug substance–related impurities (NDSRIs) and non-NDSRIs to support PAI and Compendial Development Laboratory programs.

- Completed method development for the determination of nitrite and nitrate in lactose and povidone. An application note published on the Analytical Hub at USP's Nitrosamines Exchange provides a specific procedure using ion chromatography to determine nitrite and nitrate levels in lactose. This application note is not a *USP–NF* compendial documentary standard; it is intended to serve as a resource for informational purposes only. The application note 1) was developed to facilitate risk assessment and the development of control strategies for assessing nitrite presence in high-risk excipients and 2) provides an analytical resource for global regulators and the pharmaceutical industry to establish the level of nitrites and nitrates in excipients and to study lot-to-lot variability. Read the Nitrosamines Exchange discussion for more information.
- Published a case study demonstrating the application of the carcinogenicity potency categorization approach to NDSRI PAIs on the Analytical Hub at USP's Nitrosamines Exchange. Read the Nitrosamines Exchange discussion for more information.

Setting standards that help improve global public health

Developing Flow Chemistry Capabilities

USP–India's Synthetics Laboratory has developed and optimized a continuous flow process for the synthesis of the API Sulindac Related Compound A, a nonsteroidal anti-inflammatory drug, via photochemical isomerization. The one-step process led to a significant 40% increase in product yield in comparison to the 10%–12% product yield in the three-step traditional batch process.

Developing Peptide Synthesis Capability

After successfully completing the Digital & Innovation Microgrant program on peptide synthesis, USP–India's Synthetics Laboratory has received its first request to synthesize a peptide impurity as an Analytical Reference Material (a characterized substance for use in pharmaceutical quality testing). This initiative, treated as a pilot project after proof-of-concept studies, presents an opportunity to enhance analytical research and develop capability in the field of peptide analysis.

Medicines Supply Chain Mapping Project

The Synthetics team collaborated with the Advanced Manufacturing Services and Data Analytics teams on a medicines supply chain mapping project funded by the Advanced Regenerative Manufacturing Institute and the Administration for Strategic Preparedness and Response. The project's goal is to improve the upstream API supply chain resilience by 1) evaluating commercial manufacturing routes, 2) landscaping key starting materials and trade data analytics for 26 APIs, and 3) proposing supply chain risk mitigation plans.

USP–India Biologics

The USP–India Biologics Laboratory has continued RS development and expanded its scientific capabilities to support 1) the development of new biologics standards for mAbs, CGTs, and vaccines and 2) external collaborations, including a cooperative project with the FDA comparing the multi-attribute method (MAM) to conventional methods. Additionally, the Biologics Laboratory has increased its capacity for method development and proof-of-concept work, including evaluation and refinement of multiple methods from the Analytical Procedures for mRNA Vaccines Quality draft guidelines, development of methods to support MAM, functional and structural assessment of mAbs and other therapeutic proteins, and analysis of adeno-associated virus gene therapy products for titer and empty:full ratio.

International Collaboration on Quality-Assured Medicines

In FY24 Q3, as part of USP's work toward improving alignment of quality standards with global pharmacopeias, USP and the Indian Pharmacopoeia Commission (IPC) signed a memorandum of understanding indicating their ongoing commitment to collaborate to support the production of quality pharmaceuticals. Additionally, USP staff participated in the International Meeting of World Pharmacopoeias (IMWP) in Mexico City Nov. 8–10, 2023, which included efforts to develop principles for environmental sustainability. A subteam co-led by USP and the IPC has been formed within IMWP to develop these principles and determine next steps.

USP–India Launched the Following DEIB Initiatives:

- **Male Allyship:** These sessions help equip male scientists with an awareness of the unique challenges faced by women in science, a mindset to intervene in those challenges, and the tools to act as allies against gender bias.
- **Glocal Manager:** These sessions focus on supporting people managers on situational leadership and awareness about cultural differences across sites.
- **USP One:** This initiative serves as a networking space for breaking down silos, connecting employees through shared interests, and amplifying unique voices.

Additionally, USP–India has completed the following DEIB research projects to promote diversity and an inclusive work culture:

- "How to Increase the Representation of Women Staff in USP–India Labs"
- "One Workforce Multigen Strategy"

USP–India Supported the Following Stakeholder Outreach Events:

- "USP Science Conclave," hosted by USP–India March 6, 2024, in Hyderabad. More than 250 individuals from 53 companies participated, and representatives of industry associations, regulators, and government also attended this in-person event.

- "Chromatography & Nitrosamines" workshop held in collaboration with the Central Drugs Standard Control Organization (CDSCO), Indian Drug Manufacturing Association, and Indian Pharmaceutical Association Feb. 21, 2024, in Chennai, India. Some 170 representatives of industry, associations, and regulators attended this in-person event.
- "Method Development, Nitrosamines and Process Safety" workshop held in collaboration with India's CDSCO and the Bulk Drug Manufacturers Association of India Feb. 2, 2024, in Hyderabad. Some 106 representatives of the API/bulk drug industry, trade associations, regulatory authorities, and academia attended this in-person event.
- "USP South Asia Regional Chapter Meeting" Nov. 15, 2023, in New Delhi, India. Some 100 stakeholders representing industry, regulatory agencies, government, and academia attended this in-person event.
- PDG stakeholder event Oct. 5, 2023, in Hyderabad. Some 150 industry stakeholders attended this in-person event.
- "The Pharmacopeial Discussion Group (PDG) Annual Meeting" Oct. 3–4, 2023, in Hyderabad, India. PDG representatives from EDQM, PMDA, WHO, and IPC attended this hybrid event.
- Conducted donor recognition events 1) April 23, 2024, in Mumbai, 2) April 24, 2024, in Hyderabad, and 3) April 26, 2024, in Ahmedabad, India. More than 400 participants from industry attended these events.
- Held 25 in-person User Forums and workshops attended by more than 3,370 stakeholders on priority topics, including effective use of USP RSs, USP overview, dissolution, performance verification testing, nitrosamine impurities, method validation, and PAIs.
- Conducted 17 in-person or virtual education programs for more than 950 participants from more than 250 companies. These included events for Micro, Small, and Medium Enterprises and webinars for universities and academic institutions.
- Served as speakers, presenters, or panelists at more than 50 stakeholder events.

Biologics

FY24 Highlights

USP Biologics develops and modernizes standards for diverse therapeutic products, from peptides and proteins to vaccines and cell and gene therapies (CGTs). The Biologics program is expanding standards development to cover quality testing throughout the overall biopharmaceutical product life cycle. Expert Volunteers serve on the following ECs: Biologics Monographs 1–Peptides & Oligonucleotides (BIO1), Biologics Monographs 2–Proteins (BIO2), Biologics Monographs 3–Complex Biologics and Vaccines (BIO3), Biologics Monographs 4–Antibiotics (BIO4), and Biologics Monographs 5–Advanced Therapies (BIO5).

Throughout FY24, the Biologics program worked to fulfill Resolution IV, which calls for USP to develop standards and other solutions to support innovation in the efficient development and manufacturing of quality biologics and advanced therapies to increase access to these medicines. Additional activities summarized here have been guided by Resolution III, on quality standards, and Resolution V, on innovations. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion.

Key Activities in Biologics

National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL) Project

USP, in collaboration with NIIMBL and the National Institute of Standards and Technology, has completed a multi-laboratory study comparing analytical measurements of full-to-empty particle ratio for adeno-associated virus (AAV) capsids. Participants drafted a paper for submission to a peer-reviewed journal. Additionally, USP was invited to participate in a new viral vector core facility within NIIMBL.

Impurities in mAbs and Other Protein Therapeutics

Host cell proteins (HCPs) are impurities related to the manufacturing process that can co-purify with mAbs and other therapeutic proteins. Certain HCPs pose a high risk because they can be immunogenic or degrade the drug product. The HCP Standards EP of the BIO2 EC has addressed public comments from *PF* on proposed *USP* General Chapter <1132.1> *Residual Host Cell Protein Measurement in Biopharmaceuticals by Mass Spectrometry,* and the BIO2 EC has approved the chapter to move to *USP–NF*. Six stable-isotope labeled peptide Analytical Reference Materials (ARMs) were released in early FY25 to support identification and quantitation of two high-risk HCPs by mass spectrometry. Additional ARMs are in development to support the analysis of other high-risk HCPs.

ARMs for Peptide Impurities

USP Biologics released 21 new ARMs to be used to support method development and peptide impurity identification and to ensure impurity methods' performance. Impurities for current monographs have been prioritized for development, focusing on critical product-related impurities and degradation products.

In-Line/At-Line and Real-Time Testing

The In-Line/At-Line EP of the BIO2 EC has been drafting an informational general chapter that contains general guidance and best practices for in-line/at-line and real-time testing focused on biologics challenges. The EP is working with the General Chapters' Process Analytical Technology EP of the General Chapters–Chemical Analysis EC to ensure alignment in final guidance.

New RSs and ARMs to Support Vaccines

USP Biologics released several new RSs and ARMs to support conventional vaccines, including reference materials to support sizing of polysaccharide vaccines, quality assessment of carrier protein, quantitation of squalene-based adjuvant and splitting agent in final formulation, and quantitation of host cell DNA in four additional cell lines used for vaccine production. Work also continues on mRNA-based vaccines and therapeutics, where the EC released the third edition of the mRNA Vaccine Quality Draft Guidelines. USP laboratories have completed initial assessment of several methods from the guidelines, including methods for raw materials, mRNA characterization, and assessment of impurities. These evaluations inform prioritization of methods for further validation and development of general chapters and associated RS needs. A new EP on mRNA-based vaccines, which will be responsible for drafting a new chapter on best practices and testing strategies for mRNA vaccines, has been formed.

Standards to Support Implementation of MAM

USP Biologics has invested in the development of standards and tools to support MAM, a mass spectrometry–based method that has potential to improve efficiency and specificity of characterization of protein therapeutics. MAM is designed to detect, identify, quantify, and monitor multiple product and critical quality attributes simultaneously. A new *USP* General Chapter <1060> *Mass Spectrometry-Based Multi-Attribute Method for Therapeutic Proteins* was published in *PF* 49(5) [Sep.–Oct. 2023] for public comment, and the EP has addressed the comments received. The chapter provides detailed guidance for implementation and transitioning from conventional assays, covering sample preparation, system readiness, validation, and new peak detection. Reference materials are in development to support establishing system readiness for MAM.

Lentivirus-Based Cell Therapies

USP Biologics is expanding the scope of its work in CGT and has recruited a new Lentivirus Cell Therapy EP under the BIO5 EC. The EP, which initiated its work in September 2023, has developed an outline for a general chapter on best practices for the manufacturing of lentivirus viral vector and has completed first drafts of several sections.

Progressing AAV Gene Therapy Activities

The AAV Gene Therapy EP of the BIO5 EC is finalizing a draft of a general chapter on best practices for AAV manufacturing. USP and ATCC released new host cell DNA reference materials to support quantitation of host cell DNA in cell lines commonly used for AAV production as part of an ongoing collaboration. USP Biologics also has several new reference materials in development to support testing of AAV-based products, including for raw material qualification, assessment of impurities, and analysis of product quality attributes.

Quality Considerations for Plasmid DNA

The proposed *USP* General Chapter <1040> *Quality Considerations of Plasmid DNA as a Starting Material for Cell and Gene Therapies* was published in *PF* 49(6) and received several hundred comments. The chapter describes considerations for the manufacture and release of plasmids for use as starting materials in CGT products and will assist manufacturers of gene therapy drug substances and drug products in building a control strategy. Several plasmid ARMs are also in development to support qualification of raw materials and testing for residual plasmid in final product.

Transitioning Insulin and Insulin Analog Products to *In Vitro*-Based Bio-Identity Methods

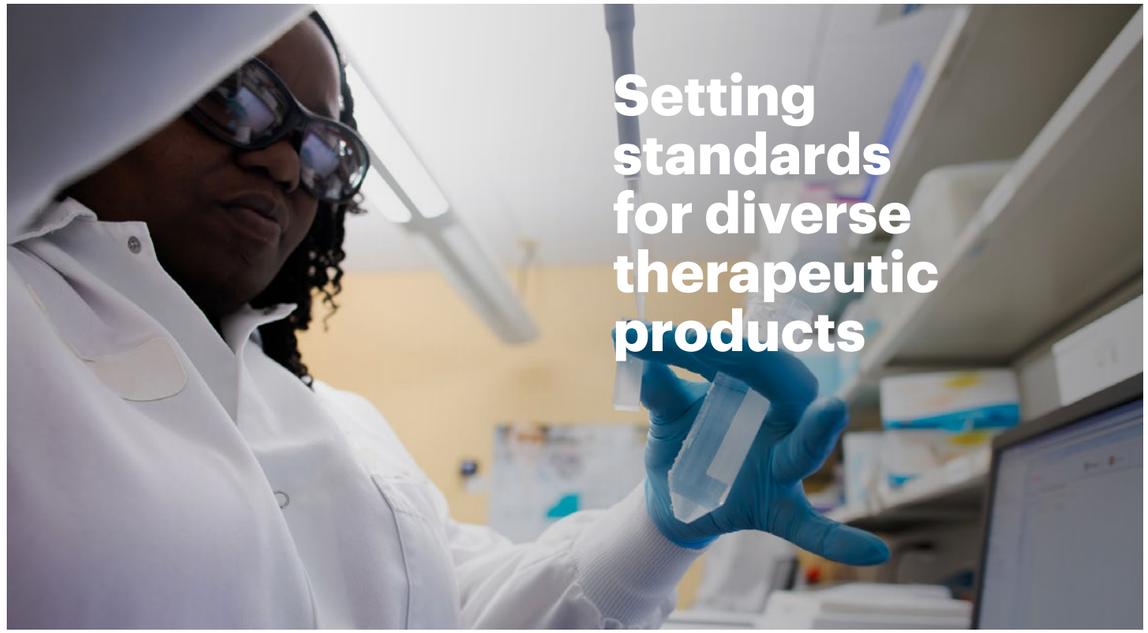
The BIO2 EC's Insulin EP completed the evaluation of the data supporting transitioning insulin human and insulin aspart products to *in vitro* cell-based testing for bio-identity. In FY24 Q3, the EP recommended moving forward with publication in *PF*, and the EC has approved publishing the proposed revision to *USP* General Chapter <121> *Insulin Assays*. The goal is to phase out the rabbit blood sugar method from *USP* General Chapter <121> *Insulin Assays*, which currently includes an *in vitro* test for two insulin analogs, Insulin Glargine and Insulin Lispro.

USP Biologics Supported the Following Stakeholder Outreach Events:

- "Innovative Analytical Approaches to Cell and Gene Therapy–Next-Generation Sequencing and Other Methods" Feb. 22, 2024, at USP–U.S., Rockville, MD. More than 350 individuals representing industry, associations, regulatory authorities, and government registered for this hybrid Stakeholder Forum.
- "Collaborating to Pave the Way for mRNA-Based Vaccines and Therapeutics Quality" Feb. 28–29, 2024. More than 800 representatives of industry, associations, regulators, government, and academia registered for this virtual event.
- "Joint USP-EDQM Symposium on Pharmaceutical Reference Standards" Sept. 27–28, 2023, at USP–U.S., Rockville. More than 500 industry, regulatory, and academia representatives registered for this hybrid event.
- "The Workshop for the Identification and Standardization of Methods for Assessing Gene Therapy Product Activity and Comparability and the Evaluation of T-Cell Therapies" Nov. 16–17, 2023, at USP–U.S., Rockville. More than 450 individuals registered online for this hybrid event, and 75 attended in person. This workshop was a collaboration between USP and the Standards Coordinating Body for Regenerative Medicine, in collaboration with the FDA to identify needed standards for assessing T-cell therapies and gene therapy product activity and comparability. The information could help guide the future development of standards for advanced therapies and shape best practices related to the assessment of CGT products.
- "2023 NIFDS-PMDA-USP Workshop for Advanced Therapy" by USP with the Republic of Korea's National Institute of Food and Drug Safety Evaluation (NIFDS) and Japan's Pharmaceuticals and Medical Devices Agency (PMDA) Nov. 30–Dec. 1, 2023, in Seoul, South Korea. Some 283 participants representing industry, regulatory agencies, and academia attended this hybrid event.
- "USP Workshop on Therapeutic Peptides and Oligonucleotides: Regulations and Quality Standards" April 9–10, 2024, at USP–U.S., Rockville. More than 150 individuals representing industry, regulatory agencies, and academia registered for this hybrid event.

USP Biologics Supported the Following Trainings:

- "Maximize Bioassay Success Using USP Standards" June 25, 2024. More than 300 representatives of industry, government, and academia registered for this live webcast.
- "USP Standards to Support the Characterization of mAbs: Applications and General Chapter <129>" June 13, 2024. More than 270 representatives of industry, government, and academia registered for this live webcast.
- A two-part series on mRNA, including "Principles and Production," held on Dec. 7, 2023, and "CMC and Analytics" Jan. 18, 2024. More than 500 individuals registered for each virtual event, with recordings now available on demand.



Setting standards for diverse therapeutic products

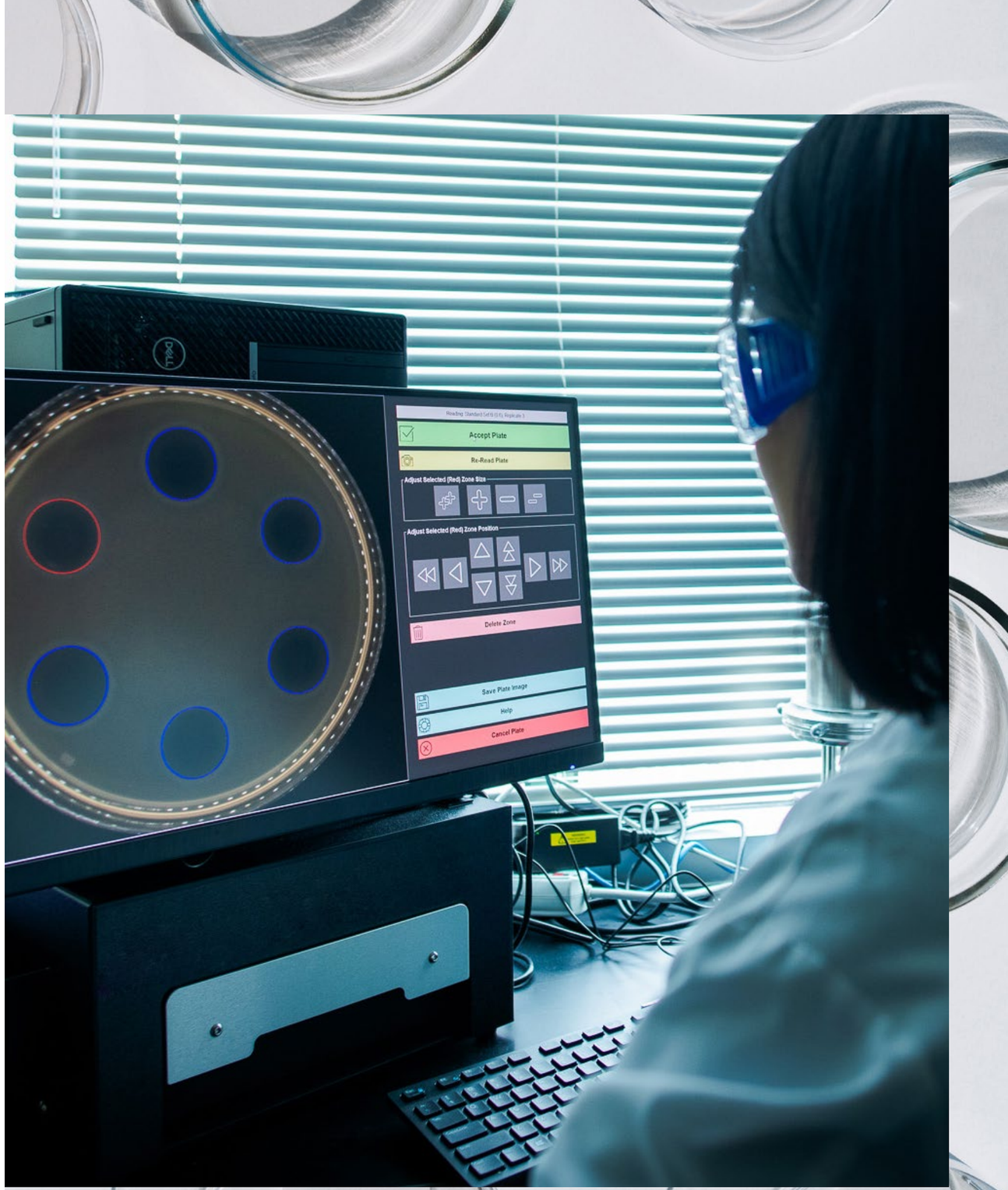
USP Biologics' Select Published Papers

- "Getting to Know MAM, the New Quality Control Strategy on the Block," and "Considerations for Robust Implementation of the Multi-Attribute Method," published March 11 and 19, 2024, respectively, in *Bioprocess Online*.
- "USP/BIOPHORUM Workshop on Continuous Manufacturing," published July 2023, in *Pharmaceutical Engineering*.
- "USP Unpacks The Evolving HCP Identification And Quantitation Story Behind <1132.1>," published Aug. 18, 2023, in *Bioprocess Online*.
- "Guidelines For mRNA Drug Product Manufacturing And Quality Control," published Sept. 15, 2023, in *Bioprocess Online*.
- "Unlocking Success: How Reference Standards Empower Small Biotech Companies," published Nov. 29, 2023, in *Biopharma Insights*.
- "Combining best practices and analytical reference materials to tackle challenges in AAV manufacturing" published April 3, 2024, in *Cell & Gene Therapy Insights*.
- "Impact of glycosylation of vaccine antigens on quality and performance," published April 12, 2024, in *Vaccine Insights*.

"BIO1 EC engaged with Expert Advisors to advance the oligonucleotide workplan and focused efforts on developing a series of technical documents to support quality standards for this rapidly growing therapeutic class. Drafting was completed on the first manuscript defining quality attributes of starting materials used in the synthesis of therapeutic oligonucleotides, and Reference Standards for these key starting materials were approved by the EC."
—Michael De Felippis, Ph.D., Chair, BIO1 EC

"The BIO3 EC approved mRNA and viral vectored vaccine guidelines, published a vaccine toolkit, and formed an mRNA Expert Panel to develop best practices for mRNA vaccines. The EC also approved a multi-site round-robin test protocol to procure data on molar mass determination of bacterial polysaccharides."
—Earl Zablackis, Ph.D., Chair, BIO3 EC

"The growth of advanced therapies has stretched plasmid DNA manufacturers, and COVID-19 brought supply chain disruptions and increasing demand for mRNA and adenovirus-vectored vaccines. We published *USP* General Chapter <1040> *Quality Considerations of Plasmid DNA as a Starting Material for Cell and Gene Therapies*.... Hundreds of comments were received from 23 stakeholders, which is a testament to the impact of the chapter."
—Mehrshid Alai, Ph.D., Chair, BIO5 EC



Small Molecules

FY24 Highlights

The Small Molecules group develops and revises monographs for drug substances and associated manufactured dosage forms for human and veterinary use. Monographs for diagnostic imaging agents are also included in this category. Expert Volunteers serve on the following ECs: Small Molecules 1 (SM1), Small Molecules 2 (SM2), Small Molecules 3 (SM3), Small Molecules 4 (SM4), Small Molecules 5 (SM5), and Over-the-Counter (OTC) Methods and Approaches. The Small Molecules group is a champion for quality medicine by providing high-quality, up-to-date standards and unique services across the product development life cycle to small molecule manufacturers and regulatory agencies worldwide.

The Small Molecules group's activities summarized here are guided by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution II, on efficiency in standards development and revision; Resolution III, on quality standards; Resolution V, on innovations; and Resolution XI, on pharmacopeial cooperation and convergence. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion.

Key Activities in Small Molecules

Launching the Small Molecules Expansion Initiative

USP recognizes that over approximately the next two cycles at current production levels, there will be a significant number of highly utilized medicines for which there will not be a *USP* monograph. To address this gap, USP has launched an initiative to significantly increase new monograph development and has recruited additional scientific staff through an Inclusive Excellence in Hiring pilot that attracted a notably large, qualified, and diverse pool of candidates. In FY24, 17 scientists based at USP–U.S., Rockville, and USP–India, Hyderabad, were hired and have been trained in monograph development to support the initiative. This new capacity will help ensure USP's relevance by developing important new monographs while ensuring that the critical work of maintaining the compendia continues to move forward and is already starting to have an impact. In FY24, Small Molecules delivered 71 new monographs compared to the 50 developed in FY23.

FDA Support for Compendial Standards and Monograph Development

After years of collaborative work with the Small Molecules group, U.S. Regulatory Affairs, and other USP staff, the FDA has added a Compendial Standards section to drug application approval letters to help ensure that drugs meet consistent standards for strength, quality, performance, and purity.

- **Compliance required:** A drug named in the official *USP–NF* generally must meet the specified standards for strength, quality, performance, and purity unless any variations are clearly indicated on the label, according to the Federal Food, Drug, and Cosmetic Act § 501(b), 21 USC 351(b).
- **Information sharing limits:** FDA cannot share specific application information with third parties, including USP.
- **Collaboration encouraged:** Drug application holders can work with USP to update official monographs in the *USP–NF* for continued compliance.

This language reflects FDA's commitment to maintaining quality standards, safeguarding public health, and providing a clear regulatory framework for the pharmaceutical industry.

User-Determined Reporting Thresholds

New *USP* General Chapter <477> *User-Determined Reporting Thresholds* was published in *USP–NF 2024 Issue 1* on Nov. 1, 2023. This chapter became official on May 1, 2024. Small Molecules monograph proposals published in *PF* 50(1) [Jan.–Feb. 2024] or later have, with certain exceptions, referenced <477> with regard to determining the appropriate reporting threshold, thus helping to better align USP monographs with ICH approaches.

Mifepristone, *Ulipristal*, and *Levonorgestrel* Monograph Proposals

After the June 2022 Supreme Court decision overturned *Roe v. Wade*, USP created a task force to identify and address the gaps in USP standards for emergency contraception and abortion medications. Recent activities by the SM5 EC to support the quality of these medications include the following:

- ***Mifepristone*:** This new monograph proposed under USP's pending monograph program (PMP) was published in *PF* 50(3) for public comment through July 31, 2024. The PMP was developed through a collaboration between USP and FDA as a practical way to expedite monograph development and revisions based on applicants' specifications provided in applications submitted to the FDA. A USP RS for this drug is already available in the USP RS catalog.

- ***Levonorgestrel*, *Levonorgestrel Tablets*, and *Levonorgestrel Intrauterine Device*:** The following proposals are anticipated to be published in *PF* 50(6) [Nov.–Dec. 2024], with new RSs in development: 1) major update to the API monograph for *Levonorgestrel* and 2) new monographs for *Levonorgestrel Tablets* and *Levonorgestrel Intrauterine System*.
- ***Ulipristal Acetate* and *Ulipristal Acetate Tablets*:** Proposed new monographs for *Ulipristal Acetate* and *Ulipristal Acetate Tablets*, published in *PF* 49(6), are approved by the SM5 EC and are anticipated to become official in *USP–NF 2025, Issue 1*. Two new USP RSs are already available in the USP RS catalog.

Emerging Standards

USP has a more iterative approach to standards development, where an emerging standard—a potential standard not yet under development—is shared through our website to help build stakeholder communities and stimulate early discussion and contribution. Emerging standards afford opportunities for stakeholders to provide input prior to formal notice and comment through publication in *PF*. Emerging standards also highlight other USP products such as PAIs and RSs. The Small Molecules group, Compendial Operations, and the Analytical Development Laboratory launched the Emerging Standards Concept website at https://go.usp.org/emerging-standards, which contains links to 12 emerging standards; an updated site with much improved functionality is anticipated in FY25. Those completed in FY24 include USP Emerging Standards for 1) Method for the Analysis of Flunisolide Nasal Spray, 2) Methods for the Analysis of Guaifenesin Extended-Release Tablets, 3) Methods for the Analysis of Doxepin Hydrochloride Cream, 4) Methods for the Analysis of Doxazosin Extended-Release

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Tablets, 5) Methods for the Analysis of Lisdexamfetamine Dimesylate Chewable Tablets, and 6) Methods for the Analysis of Clindamycin Phosphate Injection.

USP and *Japanese Pharmacopoeia* (*JP*) Prospective Harmonization Pilot Program

USP and *JP* neared completion of a pilot program to prospectively harmonize pharmacopeial standards for *Dapagliflozin Propanediol* and Dapagliflozin tablets. USP and *JP* will discuss expanding harmonization of pharmacopeial standards to additional drug substances and drug products and further contribute to harmonization and international cooperation of pharmacopeias worldwide.

OTC Pilot Study

The interlaboratory evaluation of three methods for analyzing diphenhydramine impurities in oral solution has been completed by the Diphenhydramine Joint Subcommittee (JS) and shared with the OTC Methods and Approaches EC. This JS comprises members from the OTC Methods and Approaches, SM2, SM4, and SM5 ECs. The next step involves method validation of an operational region based on AQbD principles. The OTC Pilot Study—a collaboration of USP Small Molecules staff, USP Analytical Development Laboratory staff, and external stakeholders—was designed to evaluate the transferability of three organic impurities methods developed for *Diphenhydramine Hydrochloride Oral Solution* drug product complex formulations supporting USP's overall strategy on OTC drug product standards.

Clonidine Transdermal System

The SM2 EC published a proposed revision of the *Clonidine Transdermal System* monograph as an Interim Revision Announcement (IRA) in *PF* 50(1). The proposed revision is intended to address FDA comments regarding organic impurities acceptance criteria and extraction procedures in USP monographs for transdermal systems. The comment period for this IRA ended on March 31, 2024. The EC has approved the standard, which is anticipated to become official on Aug. 1, 2024.

Small Molecules Group Supported the Following Stakeholder Outreach Event:

"Conversations with USP: Approaches to Developing + Revising General Chapters" Webex Nov. 13, 2023, with some 170 pharmaceutical, regulatory, academia, and pharmacopeia representatives from 20 countries attending.

Small Molecules Group Supported the Following Training:

"User-Determined Reporting Thresholds" on-demand webinar on *USP* General Chapter <477> *User-Determined Reporting Thresholds*, which became official on May 1, 2024.

Small Molecules Group's Select Published Paper

"Revisiting the Landscape of Potential Small and Drug Substance Related Nitrosamines in Pharmaceuticals," published Oct. 4, 2023, in *Journal of Pharmaceutical Sciences*.

"The second hybrid meeting for the six Small Molecule ECs held in April 2024, during this challenging cycle plagued by COVID, was essential to building relationships and team camaraderie in the SM1 EC. This new sense of connection, inclusion, and belonging will foster better technical discussions and personal engagement in our mission to improve medicine quality standards."

—Mary Seibel, B.Sc., Chair, SM1 EC

"The SM4 EC and Expert Panels are dedicated to improving quality standards through the establishment of numerous new and revised monographs. In addition, the Radiopharmaceutical Standards Expert Panel has revised several critical general chapters, providing much-needed guidance for this area, and worked on a proposal for a first-of-its-kind cold kit radiopharmaceutical monograph. This panel brings expertise in scientific, manufacturing, best practices, and regulatory areas."

—Kim Huynh-Ba, M.S., Chair, SM4 EC

Dietary Supplements and Herbal Medicines

FY24 Highlights

The Dietary Supplements and Herbal Medicines (DSHM) group helps protect and improve the health of millions of people who use DSHM. Expert Volunteers who serve on the Botanical Dietary Supplements and Herbal Medicines (BDSHM) and Non-Botanical Dietary Supplements (NBDS) ECs develop and revise monographs, general chapters, and USP RSs for the *USP–NF, Dietary Supplements Compendium Online,* and *Herbal Medicines Compendium*. Expert Volunteers who serve on the Dietary Supplements Admission Evaluation and Labeling (DSAEL) EC determine the admissibility of dietary supplement articles for monograph development, monitor the literature on the safety of dietary ingredients, and contribute to projects related to safety assessments of DSHM ingredients.

The DSHM group's activities summarized here are guided, in part, by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution III, on quality standards; Resolution V, on innovations; and Resolution X, which encourages USP to leverage its scientific expertise and convening power to collaborate with stakeholders and develop fit-for-purpose scientific resources and solutions that help address quality-related concerns and support additional scientific research on cannabis, cannabis-derived products, and cannabis-related compounds. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion.

Key Activities in Dietary Supplements and Herbal Medicines

Addressing Developments in the Marketplace

Adulteration of dietary supplements, dietary ingredients, and food ingredients has become a major issue in the marketplace. A JS composed of members from the BDSHM EC, NBDS EC, and Food Ingredients EC is being formed to explore strategies to help combat this adulteration. Additionally, probiotics and other live microbial products are rapidly growing segments of both the dietary supplement and Bio industries. USP is evaluating approaches to support this industry and has formed a subteam of the Probiotic EP to investigate this.

Cannabinoids Proposed as Certified Reference Materials (CRMs)

In support of the USP Materials Program strategy, four cannabinoids—cannabidiol (CBD), cannabidiolic acid (CBDA), delta-9 THC acid, and delta-9 THC—have been proposed as possible CRMs. A team of Analytical Development Laboratory and Reference Standards Laboratory scientists developed high-performance liquid chromatography-ultraviolet (HPLC-UV) assay methods for the cannabinoids and included forced degradation studies related to the long-term storage of the materials. The methods for CBD and CBDA were validated showing they are fit for their intended use. The D9-THC method has been developed and is ready for validation when the CRM team is ready to move forward.

Collaborative Study on CRM Variability

USP participated in a collaborative study on cannabinoid CRM variability organized by the American Council of Independent Laboratories. The study evaluated the potential role of CRMs in impacting the accuracy of cannabis product labels and observed ±5% variability in the content of the CRMs from multiple vendors. Although this variability may be acceptable for products based on cannabis flower, it is not suitable for ensuring the quality of pure cannabinoid APIs in the proposed Cannabidiol monograph that is under development.

Delta-8 THC Impurities

USP has collaborated with an external laboratory to generate information on the identity of impurities in synthesized delta-8 THC products and to develop analytical methods to separate these impurities using chromatographic methods. The analysis of 21 commercial vape products labeled as containing hemp-derived delta-8 THC found that all the samples failed the 0.3% delta-9 THC limit required for hemp-derived products, beyond which they are controlled substances and not classified as hemp, according to federal law. Test results also showed discrepancies between labeled and actual contents, and impurities. These findings were published Feb. 22, 2024, in the journal *Planta Medica*. These activities extend the Cannabis EP's commentary on public health concerns regarding delta-8 THC and facilitate public health measures supported by quality research materials and methods.

New Revised Proposed Monograph for Cannabis Inflorescence

USP has posted a new revised proposed monograph for cannabis inflorescence in the *Herbal Medicines Compendium* following the Cannabis EP's evaluation of the public comments received on its earlier proposal. The comment period ended July 2, 2024, on the new iteration, which aligns well with the recent *Ph.Eur.* monograph for cannabis inflorescence.

Proposed *USP* General Chapter <1568> *Cannabis Quality Attributes for Clinical Investigations*

The Cannabis EP reviewed the public comments, including from FDA, on the proposed General Chapter <1568> published in *PF* 49(3) [May–Jun. 2023]. This revised proposal would provide quality attributes that are 1) fundamental to characterizing the materials for clinical research and 2) intended to complement the FDA Guidance on cannabis quality for clinical research with specific analytical methods and acceptance criteria. A revised proposal is anticipated to be published in *PF* in FY25.

DSHM Group Supported the Following Stakeholder Outreach Events:

- "Risk Considerations for Quality Probiotics: USP Sector Event" March 20, 2024. Some 55 individuals representing industry, associations, regulatory authorities, academia, and healthcare providers registered for this virtual event.
- The 2024 Hybrid USP Stakeholder Forum June 5, 2024, with more than 400 registrants from academia, government, and industry from 26 countries.
- Served as speakers, presenters, panelists, cochairs, or organizers at more than 15 stakeholder events.

DSHM Group Commented on Cannabis-Related Issues

- Oral comments on public health consequences of changes in the cannabis policy landscape to the National Academies of Sciences, Engineering, and Medicine in Washington, DC, Sept. 14, 2023.
- Submitted comments to Bicameral Health Committee Leaders in response to a "Request for Information Regarding FDA Regulation of CBD" Aug. 15, 2023.
- Participated in panel discussions at the state Cannabis Regulators Association meeting June 4–5, 2024.

DSHM Group Supported the Following Trainings:

- "Dietary Supplements & Herbal Medicines USP Training" hybrid event June 6, 2024, in Rockville, MD.
- "FDA Botanical Drug Development Guidance" in collaboration with FDA's Center for Drug Evaluation and Research staff, July 23, 2024, in Rockville.

DSHM Group's Select Published Papers

- "Development and Validation of a GC-FID Method for the Quantitation of 8-tetrahydrocannabinol and Impurities Found in Synthetic 8-tetrahydrocannabinol and Vaping Products," published Feb. 22, 2024, in *Planta Medica*.
- "A Review of Probiotic Ingredient Safety Supporting Monograph Development Conducted by the United States Pharmacopeia (USP)," published Feb. 14, 2024, in *Journal of Dietary Supplements*.

"In FY24, BDSHM EC has cooperated with NBDS, FI, and GC–Microbiology EC members on a draft new *USP* General Chapter <1120> *Ensuring Microbiological Quality in Articles of Botanical Origin*.... Additionally, *USP* General Chapter <1568> *Cannabis Quality Attributes for Clinical Investigations* is being developed, the Cannabidiol Monograph is in *PF*, and we are finalizing a manuscript and proposed steps to inform stakeholders of the conservation and protection status of *USP, NF, DSC, HMC,* and *FCC* articles of botanical origin."
—Robin Marles, Ph.D., Chair, BDSHM EC

"The NBDS EC has made significant contributions through its participation in various subcommittees, such as one focused on qNMR as an alternative analytical method, and activities, including stakeholder involvement through Expert Panels for probiotics.... Additionally, the NBDS EC modernized existing monographs, approved several new monographs, and developed a new general chapter to guide the industry. These efforts have advanced the standards guiding the accuracy, safety, and quality of dietary supplements.
—Raimar Löbenberg, Ph.D., Chair Pro Tem, NBDS EC

Excipients

FY24 Highlights

Excipients—considered "inactive" ingredients in medicine—play an essential role in delivering APIs to their targets and can constitute up to 90% of a medication. They are critically important to how well a drug functions in the body and can cause great harm to patients if their quality is poor. The Excipients group helps ensure that excipients are fit for purpose and addresses potential threats from the complexities of global supply chains and quality deficiencies that may arise in the absence of appropriate good manufacturing practices (GMPs). Expert Volunteers who serve on the Simple Excipients (SE) and Complex Excipients (CE) ECs develop new—and revise existing—monographs and their associated RSs for pharmaceutical excipients. Expert Volunteers on the Excipient Test Methods (ETM) EC are responsible for developing and updating excipient-related general chapters.

The Excipients group's activities summarized here have been guided by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution III, on quality standards; Resolution V, on innovations; Resolution XII, on evidence generation to inform policy; and Resolution XIII, on coalition building. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion.

Key Activities in Excipients

Addressing Adulteration and Contamination Concerns

The Excipients Program Unit Team (PUT) has addressed excipient quality concerns related to adulteration and contamination in the medicines supply chain. Consistent with stakeholder feedback, Excipients ECs are addressing the request from the FDA to include a diethylene glycol and ethylene glycol testing method in the Identification section of high-risk excipients. This includes the publication of the *Polyethylene Glycol* (PEG) monograph revision proposal through an Interim Revision Announcement in *PF* 50(3), with public comments open through July 31, 2024, and development of a proposed new *USP* General Chapter <470> *Determination of Diethylene Glycol and Ethylene Glycol in Polyethylene Glycol,* anticipated to be published in *PF* 50(5) [Sep.–Oct. 2024].

The Excipients PUT has been collaborating with PEG manufacturers to optimize the gas-chromatography ethylene glycol/diethylene glycol (EG/DEG) method for use as an identification test in the PEG monograph. USP is collaborating with the FDA laboratory on this task as well. A General Announcement was posted on Sept. 29, 2023, providing notice that the Complex Excipients EC intends to revise the PEG monograph by including a Limit of EG and DEG test in the Identification section to address the risk of EG/DEG contamination in PEG.

Addressing Excipient Compositional and Variability Challenges

Excipients ECs are collaborating on evolving, iterative approaches that address excipient compositional and variability issues as well as the lack of standardized methods and materials. These include the anticipated introduction of new techniques through general chapters that cover multiple monographs and development of more than 30 new RSs for molecular weight standards for polymeric excipients. To address the needs of complex generics, 14 lactide or lactic acid and glycolide or glycolic acid (LG) polymer Analytical Reference Materials are in development along with associated application notes.

USP Offers New App Note to Detect Nitrites in Common Excipients

USP scientists published an application note titled "Determination of Nitrite and Nitrate in Lactose by Ion Chromatography" as part of nitrosamine risk assessment in excipients on the Analytical Hub at USP's Nitrosamines Exchange. The new app note, which has been downloaded more than 500 times, was developed to facilitate the risk assessment and development of control strategies for assessing nitrite impurity presence in lactose. The method can help users determine the levels of nitrite and nitrate impurities simultaneously, which addresses the unlikely chance of nitrate impurities being reduced to nitrite impurities under specific conditions. The app note is not a *USP–NF* compendial documentary standard; it is intended to serve as a resource for informational purposes only. Read the Nitrosamines Exchange discussion for more information.

Novel Excipients Interlaboratory Studies

Novel excipients that have no prior use in a drug or food are not yet eligible for *National Formulary* admission; however, some of these excipients are now used in LNP platform delivery systems (e.g., COVID vaccines). USP is engaging stakeholders to identify potential collaborative opportunities, including development of stand-alone general chapters and guidelines to meet evolving regulatory quality expectations for these lipid-type excipients. USP Laboratories participated in an interlaboratory study of liposomal lipid quantitation using liquid chromatography with tandem mass spectrometry.

Excipients Group Supported the Following Stakeholder Outreach and Training Events:

- "Overview of *USP–NF* GMP General Chapters Relevant to Excipients" live webcast June 13, 2024, attended by 15 registrants representing industry.
- Served as speakers, presenters, or panelists at more than 10 stakeholder events.

Excipients Group's Select Published Papers:

- "In Equal Measures: The Importance of Excipient Quality," published Sept. 3, 2023, in *Pharmaceutical Technology*.
- "Ensuring Product Safety: U.S. FDA Guidance on Testing High-Risk Drug Components for Diethylene Glycol and Ethylene Glycol," published Sept. 21, 2023, in *Quality Matters*.
- "USP's characterization of commercial poly(lactic-co-glycolic acid) utilizing SEC-Multi-Angle Light Scattering and Refractive Index techniques via Absolute Method approach," published December 2024, in *Journal of Pharmaceutical and Biomedical Analysis Open*.

"The SE EC focused on global quality this year, working on harmonizing monographs and addressing issues like counterfeiting and adulteration. The EC worked with the FDA and excipient manufacturers to focus on establishing specifications for identified impurities. EC members were also very active in engaging with stakeholders at national and international conferences.... The EC is looking forward to expanding its breadth to reflect the additional monographs identified in the pipeline refresh, such as those related to complex generics, biologics, and innovative therapeutics."
—Eric Munson, Ph.D., Chair, SE EC

Excipients: Essential to delivering APIs to their targets

Food Ingredients

FY24 Highlights

Expert Volunteers who serve on the Food Ingredients (FI) EC focus on developing standards for FIs to ensure the identity, quality, and purity of food additives, processing aids, flavors, colors, and other substances used to manufacture food products. These standards are published in the *Food Chemicals Codex* (*FCC*), which is used by product developers, ingredient suppliers, food manufacturers, testing laboratories, and regulators in the United States and internationally. The FI EC works closely with the Botanical Dietary Supplements and Herbal Medicines and the Non-Botanical Dietary Supplements ECs to coordinate the development of standards for substances that are used as both FIs and dietary ingredients.

The Foods team's activities summarized here have been guided by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution II, on efficiency in standards development and revision; Resolution III, on quality standards; Resolution V, on innovations; Resolution VII, on education and training for industry and healthcare professionals; Resolution XIII, on coalition building; and Resolution XV, on impact expansion.

Key Activities in Food Ingredients

Foods Strategy Refresh

In April, a Foods PUT Strategy refresh cross-functional team concluded its task of identifying three priority/impact areas that will inform the direction of the Foods PUT in the 2025–2030 cycle:

1. Advanced Contaminant Methodology Development: Enhance methods and establish detection limits and risk assessment tools for critical food contaminants (e.g., elemental impurities [lead], pesticides, mycotoxins).
2. Innovative Ingredients and Technologies: Focus on emerging trends in food research and development, such as novel oils from fermentation and advanced analytical technologies.
3. Regulatory Strength Capitalization: Leverage *FCC*'s legal recognition in various countries to influence and enhance global food standards and forge stronger connections with the FDA.

Infant Formula Strategy Development

The Infant Formula Subcommittee (SC), formerly the Infant Formula Working Group, has been formed to identify areas where *FCC* could offer support to infant formula, supply chain, and quality challenges in response to various quality concerns, recalls, and shortages of infant formula products in the United States and Canada. Following the creation of the Infant Formula Guide, the SC now is focused on building a strategy to address the wider needs of the infant formula industry and regulatory agencies. The subcommittee plans to host a roundtable discussion with regulators and industry in FY25.

Proposed New Lactoferrin From Bovine (*Bos taurus*) Milk Monograph

The draft monograph was published in the *FCC Forum* in June 2024 and is anticipated to be published in the *Second Supplement* to *FCC 14*. Lactoferrin from bovine milk functions as an antimicrobial agent. Lactoferrin is also found in human breast milk and has been added to some infant formula products.

Proposed New Mung Bean Protein Monograph

The draft monograph was published in *FCC Forum* in June 2024 and is anticipated to be published in the *Second Supplement* to *FCC 14*. Mung bean protein functions as a water and fat binder, stabilizer, thickener, and emulsifier. Plant-based proteins continue to be of interest to industry and consumers.

Spices

Laboratory work has been completed for turmeric, and a new identity standard is anticipated to be proposed in FY25. New identity standards for paprika, garlic, ginger, and cumin are under development. A new

test, "Added Colors in Spices," was proposed in *FCC Forum* in December 2023 to be added to Appendix XIII: Adulterants and Contaminants in Food Ingredients, as a nontargeted method for detecting undeclared colorants added to spices and spice mixtures. Spices remain at risk for adulteration, and the Foods team is continuing conversations with industry on how best to manage risk, including for elemental impurities.

High-Value Food Oils

Development of high-value food oil monographs, including for Sacha Inchi Oil, is ongoing. Work on these standards is prioritized by the Codex Committee on Fats and Oils.

Natural Colors

A new Appendix XXI: Guidelines for the Control of Contaminants in Food Colors from Natural Sources is proposed to provide regulatory information and recommended specifications, test methods, and mitigation strategies to aid in the control of specified contaminants in food colors from natural sources. Additionally, new monographs were proposed for 1) Cochineal Extract and 2) Chlorophyllins, Copper Complexes Sodium, and Potassium Salts. All were published in *FCC Forum* in June 2024 and are anticipated to be published in the *Second Supplement* to *FCC 14*.

Olive Oil Authenticity

A new guidance document, "Current Knowledge of Odor Active Volatile Compounds—A Prospective Study of Their Contribution to the Accurate Management of Sensory Characteristics of Virgin Olive Oils," was proposed to be added to Appendix XIX: Olive Oil Guidance, Methods, and Applicable Resources in *FCC Forum* in June 2024 and is anticipated to be published in the *Second Supplement* to *FCC 14*.

Honey Resources

Proposed New Appendix XX: Honey Guidance, Methods, and Applicable Resources initially contains methods used across honey identity standards, a fraud mitigation guidance document, and decision criteria for honey purity testing to help users determine the appropriate test methods to apply. It is anticipated that the appendix will be updated as additional standards and guidelines are developed and proposed in future issues of the *FCC Forum*. It was published in *FCC Forum* in June 2024 and is anticipated to be published in the *Second Supplement* to *FCC 14*.

"The FI EC continued its outstanding history of adopting and promoting highest-level standards for food additives and ingredients to ensure their nutrition, value, integrity, and quality while guarding against incidental and purposeful adulteration. It was amazing to watch the scientific staff perform and grow, carrying out our monographic responsibilities exploring new arenas as we underwent leadership changes. To capitalize on the successes of the FI EC's work on reducing risks of adulteration and contamination in foods and food ingredients, a JS with the BDSHM and NBDS ECs has been initiated to share the knowledge and expertise."

—Jonathan DeVries, Ph.D., Chair, FI EC

General Chapters

FY24 Highlights

***USP* General Chapters provide best practices for analytical techniques and standards for evaluating their performance, test procedures and respective acceptance criteria, general information for the interpretation of the compendial requirements, and general guidance to manufacturers of official substances and products represented in *USP–NF* monographs.** Expert Volunteers serve on the following General Chapters Collaborative Group Expert Bodies: General Chapters–Chemical Analysis (GCCA), General Chapters–Dosage Forms (GCDF), General Chapters–Measurement & Data Quality (GCMDQ), General Chapters–Microbiology (GCM), General Chapters–Packaging and Distribution (GCPD), General Chapters–Physical Analysis (GCPA), and General Chapters–Statistics (GCSTATS) ECs and their affiliated EPs and subcommittees. Their work impacts the quality control, packaging, and supply integrity of drugs and drug products, as well as standards governing instrument and system qualification and analytical procedure, validation, verification, and transfer.

The General Chapters group's activities summarized here have been guided by Resolution I, on collaboration with the FDA and other stakeholders on health priorities; Resolution III, on quality standards; Resolution V, on innovations; Resolution XI, on pharmacopeial cooperation and convergence; Resolution XII, on evidence generation to inform policy; and Resolution XIII, on coalition building. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion.

Key Activities in General Chapters

Revised Suite of USP Packaging Chapters

USP's suite of packaging chapters includes revised *USP* General Chapter <661> *Plastic Packaging Systems and Their Materials of Construction* as well as new *USP* General Chapters <661.1> *Plastic Materials of Construction* and <661.2> *Plastic Packaging Systems for Pharmaceutical Use,* both of which are anticipated to become official on Dec. 1, 2025. To help stakeholders prepare, USP organized a virtual dialogue that included FDA and industry presentations and panel discussions on March 28, 2024. Some 250 individuals representing industry, academia, and FDA registered for this event.

Proposed New Chapters on Microbial Methods

The Rapid Microbial Methods Subcommittee of the GCM EC has published proposed new *USP* General Chapters <72> *Respiration-Based Microbiological Methods for the Detection of Contamination in Short-Life Products* and <73> *ATP Bioluminescence-Based Microbiological Methods for the Detection of Contamination in Short-Life Products* and has proposed revision of *USP* General Chapter <1071> *Rapid Microbiological Methods for the Detection of Contamination in Short-Life Products—A Risk-Based Approach* as the parent chapter in *PF* 50(1) with public comments accepted through March 31, 2024. The public comments were reviewed and incorporated into the text, and those three refined chapters are anticipated to be balloted in October 2024.

The GCM EC has also proposed a new chapter on rapid microbial testing titled *USP* General Chapter <77> *Mycoplasma Nucleic Acid Amplification Tests*, which is anticipated to be published in *PF* 51(1) [Jan.–Feb. 2025] with public comments open through March 31, 2025. Additionally, the GCM EC is collaborating with stakeholders to develop a new chapter on rapid microbial testing titled *USP* General Chapter <74> *Solid Phase Cytometry-Based Microbiological Methods for the Detection of Contamination in Short-Life Products*.

Proposed New *USP* General Chapter <86> *Bacterial Endotoxins Test Using Recombinant Reagents*

The GCM EC has proposed new General Chapter <86> as an alternative to *USP* General Chapter <85> *Bacterial Endotoxins Test*. The proposed chapter introduces additional techniques for bacterial endotoxin testing using nonanimal-derived reagents such as recombinant Factor C and recombinant cascade reagents. The proposal was published in *PF* 49(6) and posted through a General Announcement. Based on comments, the text has been revised to refine the proposed chapter for ballot.

Revision to *USP* General Chapter <660> *Containers—Glass*

General Chapter <660>, which the GCPD EC revised to address public health concerns regarding global glass production and the potential for resulting drug shortages, became official Oct. 1, 2023. The EC completed a revision proposal of <660> and its companion *USP* General Chapter <1660> *Evaluation of the Inner Surface Durability of Glass Containers*, which is anticipated to be published in *PF* 50(5) for stakeholder feedback.

Major Revision to Harmonized General Chapter <429>

The proposed revision of *USP* General Chapter <429> by the GCPA EC, including the proposed new title, *Particle Size Analysis by Laser Light Diffraction*, was prompted by public inquiries, advancements in the field, and updates to related internationally recognized standards. This is a harmonized chapter within the Pharmacopeial Discussion Group (PDG), and the proposed revision has been published in *PF* 49(5) for public comment, which closed Nov. 30, 2023. The GCPA EC has addressed the public comments and provided the responses to the PDG.

New *USP* General Chapter <1002> *Filters and Membranes*

A proposal for new General Chapter <1002> was published in *PF* 50(2) for public comment through May 31, 2024. This proposal was developed by the GCDF EC with a working group that included major filter manufacturer representatives.

Bioassay Chapter Revision

USP General Chapter <1030> *Biological Assay Chapters—Overview and Glossary* was published in *PF* 50(2) for public comment through May 31, 2024. The General Chapters–Statistics EC has proposed to update and expand the scope of the current chapter. This major revision will assist bioassay professionals in starting with the more technical

USP General Chapters <1032> *Design and Development of Biological Assays*, <1033> *Biological Assay Validation*, and <1034> *Analysis of Biological Assays*.

New *USP* General Chapter <1083> *Supplier Qualification*

General Chapter <1083>, which was developed by the GCPD EC to support pharmaceutical supply chain resilience, became official on Aug. 1, 2023. This chapter emphasizes the importance of supplier qualification through a risk-based approach for selecting, assessing, approving, and monitoring suppliers of materials and services. Using the principles in <1083> to qualify suppliers of raw materials, ingredients, and services for foods and dietary supplement ingredients can help safeguard the integrity of those supply chains as well.

Intent to Revise *USP* General Chapter <621> *Chromatography*

The proposed revision to General Chapter <621> was published as an in-process revision in *PF* 49(6) with a target official date of May 1, 2025. The proposed revision responds to stakeholder comments and requests for clarification regarding the application of the new System Sensitivity and Peak Symmetry requirements of General Chapter <621> to existing monographs.

Updating NMR Chapters

The qNMR EP of the GCCA EC concluded its draft revisions to *USP* General Chapters <761> *Nuclear Magnetic Resonance Spectroscopy* and <1761> *Nuclear Magnetic Resonance Spectroscopy—Theory and Practice* and initiated a draft of the new *USP* General Chapter <1762> *Solid-State Nuclear Magnetic Resonance Spectroscopy—Theory and Practice*. General Chapters <761> and <1761> were republished in *PF* 49(5) to reflect the updates and revisions based on the feedback received.

Complex Generics PUT Updates

The Complex Generics team has identified more than 100 candidate materials—including extractables and leachables (E&L), biorelevant dissolution reagents, non-U.S. APIs, and injectable physical materials—for the material strategy team's market and business case evaluation and next steps. The Complex Generics team collaborated with a contract research organization and procured genotoxic rubber oligomers for use in the identification and quantitation of these compounds if present in the drug products. An application note for the analysis of these rubber oligomers has been developed and is in the final stages of publishing. The system suitability E&L standards are being evaluated by more than 12 labs across the globe to make sure the proposed set of standards would work in different labs and locations.

Additionally, the team is evaluating the introduction of several PLGA polymer analytical RSs to support the generic microsphere formulations. Another application note for the accurate identification of the type of PLGA polymer used is in preparation. This will help the complex generic industry quickly identify the PLGA polymer present in the brand-name product. The USP Complex Generics team has visited more than 19 complex generic and supporting vendors in India during September 2023 and collected extensive feedback on the technical and regulatory challenges to manufacture complex products. The Complex Generics team is also working with the GCDF EC to develop three new proposed general chapters to support microsphere, iron colloidal products, and drug-device combination products.

New General Chapters that Support PCM Strategy

In a gap analysis for material characterization techniques relevant to PCM, the GCPA EC has identified a need for proposed new general chapters to address wetting properties, compaction simulation, and electrostatic properties characterization. The EC collaborated with working groups that included members from industry and academia on the following:

- A proposal for new *USP* General Chapter <1243> *Wetting Properties of Pharmaceutical Systems*, published in *PF* 49(5) for public comment through Nov. 30, 2023. The GCPA EC and working group have addressed public comments and advanced the chapter to ballot in June 2024. The EC has approved the chapter for inclusion in *USP–NF 2025 Issue 1*. It is anticipated to become official on May 1, 2025.
- A proposal for new *USP* General Chapter <1245> *Compaction Simulation*, published in *PF* 50(4) [July.–Aug. 2024] for public comment through Sept. 30, 2024.

Additionally, the working group on electrostatics led by the GCPA's Powders Subcommittee has drafted a proposal for new *USP* General Chapter <1244> *Electrostatic Properties of Pharmaceutical Systems* and is reviewing and refining the content.

General Chapters Group Supported the Following Stakeholder Outreach Events:

- "USP and Academia Workshop on Analytical Procedure Lifecycle and AQbD: ICHQ14/Q2(R2) and Compendial Approaches" May 29, 2024, in Pavia, Italy. Ninety participants representing industry, regulatory agencies, and academia attended this in-person event.
- "USP Modern Methods for Endotoxins and Pyrogens Testing Virtual Workshop" May 14–15, 2024. Some 990 participants representing industry, regulatory agencies, and academia attended this virtual USP workshop.
- "Solid-State NMR Spectroscopy in the USP Pharmacopeial Forum" April 25–26, 2024. More than 80 participants representing industry, regulatory agencies, and academia attended this virtual Open Forum.
- "3rd USP qNMR Symposium" Dec. 11, 2023, in Shanghai, China. More than 70 participants from industry, regulatory agencies, and academia attended this in-person event.
- Served as speakers, presenters, or panelists at more than 121 stakeholder events.

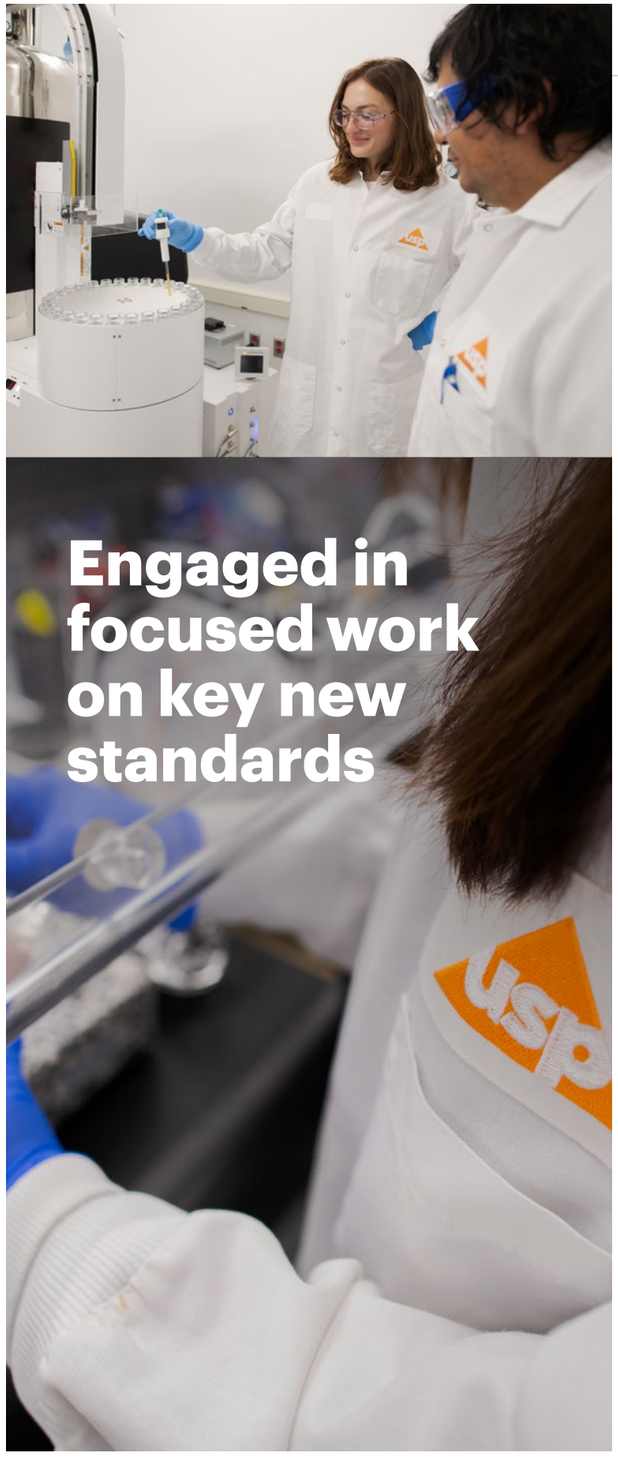
General Chapters Group Supported the Following Trainings:

- "Solving Problems that Matter: A Waters Webinar Series Featuring USP Speakers" available on demand.
- "Harmonized USP Chapter <621> *Chromatography*—Recent Revisions" Agilent webinar series Feb. 27, 2024.
- Navigating Regulatory Shifts: Insights into Nitrosamines and NDSRIs Workshop May 14, 2024, in Bridgewater, NJ, and May 16, 2024, in Holtsville, NY.
- Nitrosamines: Risk Control and Strategies Roundtable at the 26th Annual Symposium of the American Association of Pharmaceutical Scientists–Northeast Regional Discussion Group March 22, 2024, in Groton, CT.

General Chapters Group's Select Published Papers

- "Ongoing Analytical Procedure Performance Verification Using a Risk-Based Approach to Determine Performance Monitoring Requirements," published Jan. 8, 2024, in A*nalytical Chemistry*.
- "*In-Vitro* Product Performance Testing of Oral Drug Products—Views of the USP Expert Panel," published March 1, 2024, in *PF* 50(2).
- "USP Responses to Comments for *Stimuli* Articles on Analytical Instrument and System (AIS) Qualification," published May 2, 2024, in *PF* 50(3).

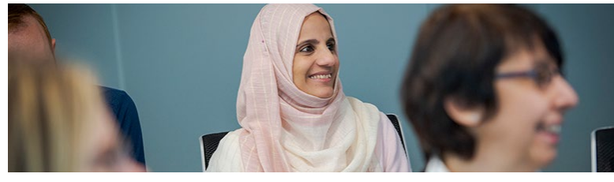
"GCCA EC has worked on several high-impact projects this cycle. Notably, harmonization of *USP* General Chapter <621> *Chromatography* was accomplished, and harmonization of *USP* General Chapter <233> *Elemental Impurities—Procedures* is imminent. Separately, a joint subcommittee devoted to another high-impact chapter [on good documentation guidelines] has resulted in a recommendation for a revision to better support future data integrity and data governance chapters.... Moving two high-priority qNMR chapters to official status as well as holding qNMR workshops and forums are significant accomplishments, as are efforts regarding organic impurities, including completion of <477> *User-Determined Reporting Thresholds*."
— Nancy Lewen, B.Sc., Chair, GCCA EC



"The GCMDQ EC has been working hard this year to improve important general chapters, making them more useful for the pharmaceutical industry. Significant progress has been made on the balances and volumetric apparatus chapters.... The chemometric chapter is nearly finished and will be a comprehensive guide for the industry. Several high-impact papers have been published to support <1220> and have been well received. The team is also supporting the revision of <1058> *Analytical Instrument Qualification*. All these efforts aim to help the pharmaceutical industry with effective and fit-for-use analytical procedures."
—Jane Weitzel, B.Sc., Chair, GCMDQ EC

"GCPA EC remains dedicated to furnishing comprehensive guidelines and methodologies for the physical characterization of drug products, substances, and excipients. These resources serve as invaluable tools for pharmaceutical manufacturers, ensuring the consistent production of high-quality pharmaceuticals. A notable example of this ongoing effort is the release of General Chapter <1149> *Guidelines for Assessing and Controlling the Physical Stability of Chemical and Biological Pharmaceutical Raw Materials, Intermediates, and Dosage Forms*, which has been well received by the stakeholders."
—Kate Houck, Ph.D., Chair, GCPA EC

"The GCM EC has had an extremely productive year. This highly creative and collaborative team has engaged in biweekly working sessions of four subcommittees, enabling focused work on key new standards.... The GCM EC had an outstanding opportunity to reach out to stakeholders through a workshop organized by USP covering rapid microbiological methods and pyrogen/endotoxin testing, which showcased new technologies and perspectives from industry and academic leaders. The meeting materials, discussions, questions, and presentations provided detailed data and information that will further assist the GCM EC in the development of meaningful and practical standards in the near future."
— Mark Schweitzer, Ph.D., Chair, GCM EC



Healthcare Quality and Safety Center of Excellence (HQS)

FY24 Highlights

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The HQS group is a designated Center of Excellence that enables USP to deliver quality standards and solutions that meet the needs of healthcare professionals to help improve medicine quality, patient safety, and access. HQS provides the following:

- Standards and solutions that enhance quality, accessibility, and equity of medication practices.
- Data and digital tools designed to improve the use of standards in knowledge sharing, decision-making, and reporting.
- Standards and solutions for quality medication and treatment tailored to the individual characteristics of each patient.

Expert Volunteers serve on the Compounding (CMP), Healthcare Information and Technology, Healthcare Safety and Quality (HSQ), and Nomenclature and Labeling (NL) ECs and related EPs and subcommittees. Together, these Expert Volunteers deliver quality standards and solutions that address the needs of patients, healthcare professionals, and overall public health, including standards and solutions for safe medication use, drug formulary classification, sterile and nonsterile compounded preparations, the handling of hazardous drugs, and the naming and labeling of drug products and ingredients.

The HQS group's work is guided by Resolution I, on collaboration with FDA and other stakeholders on health priorities; Resolution III, on quality standards; Resolution V, on innovations; Resolution VI, on digital transformation of standards; Resolution VIII, on regulatory systems strengthening; Resolution IX, on compounding; Resolution XII, on evidence generation to inform policy; and Resolution XIII, on coalition building. Stakeholder outreach events and published papers highlighted here align with Resolution II, on efficiency in standards development and revision; Resolution VII, on education and training for industry and healthcare professionals; and Resolution XV, on impact expansion.

Key Activities in Healthcare Quality and Safety

Personalized Medicine

HQS staff, in collaboration with key stakeholders, have developed a science-based personalized medicine workplan that provides research and information on pharmacogenomics (PGx) and digital therapeutics (DTx). HQS continues to engage experts on topics, including PGx electronic health record and clinical decision support integration, PGx and DTx health equity, DTx labeling, and DTx version control. In FY25, results from studies, surveys, and roundtable discussions with experts on these topics will be available in *Stimuli* and journal articles as well as on the USP Personalized Medicine webpage.

USP Achieves a Major Milestone as Revised Compounding Chapters Became Official

USP attained a key achievement as the revised *USP* General Chapters <795> *Pharmaceutical Compounding—Nonsterile Preparations* and <797> *Pharmaceutical Compounding—Sterile Preparations* became official in FY24. Both are available in *USP–NF* and through the *USP Compounding Compendium*. The revisions to <795> and <797> incorporate extensive stakeholder feedback and reflect advancements in science and practice that help ensure quality compounded preparations, promote public health, and protect patients and healthcare workers.

Also, *USP* General Chapter <800> *Hazardous Drugs—Handling in Healthcare Settings* became compendially applicable where General Chapters <795> and <797> apply. Additionally, revised *USP* General Chapter <825> *Radiopharmaceuticals—Preparation, Compounding, Dispensing, and Repackaging* is now compendially applicable because it is referenced in <795> and <797>. USP has continued to develop resources in response to topics raised by stakeholders during the revision of <795> and <797>.

USP Drug Classification 2024 Updates

On Dec. 15, 2023, USP published, and made available for download, the 2024 USP Drug Classification (USP DC), an independent comprehensive drug classification system developed to assist with formulary support outside of Medicare Part D. USP DC is used in drug formulary development or review of drugs used in nonacute or outpatient care settings. This tool has the potential to provide guidance toward the design and comparison of balanced formularies. Additionally, based on stakeholder feedback, USP DC Plus was created, which features a new online interactive tool with more detailed, real-time access and additional coding and taxonomy features to facilitate cross-walking (i.e., coding terminologies) with formularies.

USP Medicare Model Guidelines (MMG) Updates

On Sept. 29, 2023, USP published the USP MMG v9.0 to accommodate new drugs and therapeutic uses under a Cooperative Agreement between USP and the Centers for Medicare & Medicaid Services. A total of 115 new drugs approved by the FDA between Nov. 1, 2019, and June 30, 2023, were added to MMG v9.0. Additionally, one category was removed, and four classes were added to MMG v9.0.

USP General Chapter <7> *Labeling* Updates

The NL EC has proposed revisions to General Chapter <7> in *PF* 50(3). Proposed revisions to the chapter include removal of ratio expressions from drug products that contain epinephrine; modifications for Potassium Chloride for Injection Concentrate that was impacted by the current glass shortage issue; and label revisions for dietary supplements such as iron to help reduce medication errors when patients switch from prescription to dietary supplement products. The public comment period closed on July 31, 2024.

Accelerating HQS Standards

USP has accelerated HQS standards development to fill key gaps in the supply chain, medication safety, and health literacy. HQS has established a webpage at https://www.usp.org/healthcare-quality-safety/health-literacy to provide health literacy tools and solutions for healthcare professionals that promote patient understanding and mitigate medication errors. Two new solutions provided include "How to create a medication guide" and "How to read an OTC label." The HSQ EC completed its review of *USP* General Chapter <1265> *Written Prescription Drug Information—Guidelines*, which focuses on format, content, and accessibility of prescription drug information. The proposed revision has been published in *PF* 50(4) for public comment through Sept. 30, 2024.

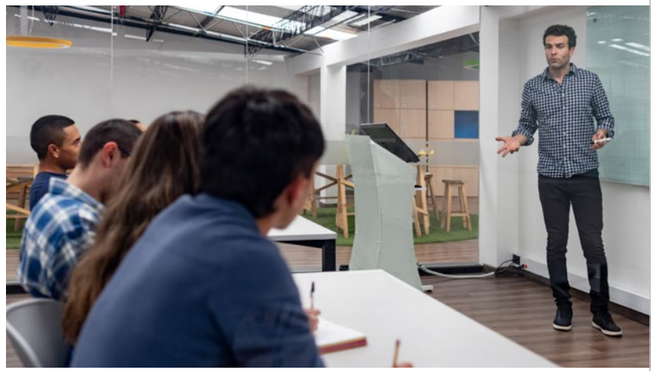
Additionally, the HSQ EC has begun the revision process for *USP* General Chapter <1066> *Physical Environments that Promote Safe Medication Use* to establish guidelines and standards for creating physical environments within home and healthcare settings that contribute to the safe use of medications. Various physical attributes in the home or healthcare setting may help or hinder medication usage. This chapter emphasizes the importance of designing and maintaining spaces where medications are stored, prepared, dispensed, and administered in a manner that minimizes the risk of errors and promotes patient safety.

The HQS Group Supported the Following Stakeholder Outreach Events:

- "USP Digital Therapeutics (DTx) Labeling Roundtable" Feb. 27, 2024. Fifteen stakeholder leaders participated in this virtual event.
- Served as speakers, presenters, or panelists at more than 12 stakeholder events.

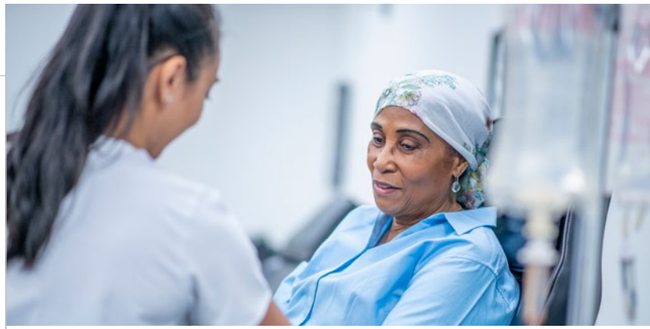
The HQS Group Supported the Following Trainings:

- "Labeling Requirements for Prescription Drugs, Updates, and Future Direction for Chapter <17>" on-demand webinar.
- HQS Annual Spring Compounding Standards Training sessions on <795>, <797>, and <800> May 7–9, 2024.
- The Compounding (CMP) EC continued to support implementation of General Chapters <795>, <797>, and <800> with education courses and audience-specific webinars for 21 stakeholder organizations attended by an estimated 3,000 participants in FY24.



The HQS Group's Select Published Papers:

- "Operational Considerations During Manufactured Product Shortage: Preparing Amoxicillin Compounded Oral Suspension," published March 6, 2024, on USP.org.
- "Innovating for Individual Care: The Impact of USP on Personalized Medicine," published March 1, 2024, in *Quality Matters*.
- "Ongoing Analytical Procedure Performance Verification Using a Risk-Based Approach to Determine Performance Monitoring Requirements," published Jan. 8, 2024, in *Analytical Chemistry*.



"During FY24, the Compounding EC published final revisions of <795> and <797> in *USP–NF*. To enhance stakeholder understanding of the revisions, the CMP EC presented at 17 stakeholder events and developed several supplementary documents on key compounding topics."
—Brenda Jensen, M.A., Chair, Compounding EC

"In addition to review and approval of dozens of compendial names for drug products, drug substances, excipients, dietary supplements, and compounded preparations, the NL EC is very proud of two accomplishments over the past year: 1) Sept. 1, 2023, implementation of standardized expiration date formats to help end confusion for patients and consumers, healthcare practitioners, and manufacturers and 2) publishing *USP* General Chapter <7> into *PF* with high-impact revisions for manufacturing and healthcare stakeholders."
—Stephanie Y. Crawford, Ph.D., M.P.H., Chair, NL EC

"The HSQ EC's proudest accomplishments of FY24 include the publishing of Medicare Model Guideline v9.0 and USP Drug Classification 2024. Additionally, the EC drafted a health equity paper focused on ensuring equitable access to quality medicines for all communities."
—Melody Ryan, Pharm.D., M.P.H., Chair, HSQ EC

Helping to improve medicine quality, patient safety, and access

Expert Volunteers and Government Liaisons

Among USP's greatest assets are the transparency and scientific rigor that 652 Expert Volunteers and 239 Government Liaisons helped bring to USP's standards-setting process in FY24. Through the contribution of their expertise, they have helped ensure the identity, strength, quality, and purity of chemical and biological medicines, excipients, dietary supplements, and food ingredients and have benefited consumers, patients, and other stakeholders in the United States and around the world.

The CoE—consisting of the 29 EC Chairs listed in the following table, plus Jaap Venema, Ph.D., USP's Chief Science Officer & CoE Chair—oversees the activities of numerous global scientific experts who serve on ECs, EPs, and JS3s. These Expert Volunteers play a vital role in providing expertise and in the development of standards by participating in Expert Body discussions and reviewing documents and information. EC members approve USP Documentary Standards for publication and Reference Standards for release. They ballot on all regular documentary standards revisions, new Reference Standards, and a sampling of Replacement and Continuation Lots.

Visit usp.org/get-involved/volunteer

to learn more about how volunteers contribute to USP's more than 200-year-old mission to improve global health through public standards and related programs that help ensure quality medicines, foods, and dietary supplements.

The Expert Volunteer Recruitment Team

has kicked off USP's Expert Volunteer Recruitment efforts (formerly known as the Call for Candidates) and launched USP's "Become a USP Expert Volunteer" webpage, which features a new "Apply now" button that links applicants to USP Expert Volunteer opportunities.

Government Liaisons—representatives from the FDA, other federal or state government agencies in the United States, and government agencies in other countries—contribute to discussions at Expert Body meetings to which they are assigned. Government Liaisons do not vote on standards that are up for ballot. They offer opinions on all facets of standards development from the perspective, and on behalf, of the government agency they represent, and may be tasked with seeking further information or soliciting opinions from the agency they represent.

Collaborative Groups

Biologics	Small Molecules	Excipients	General Chapters	Healthcare Quality & Safety	Dietary Supplements & Herbal Medicines, Food Ingredients
Biologics Monographs 1–Peptides & Oligonucleotides EC Michael De Felippis, Ph.D., Chair	**Small Molecules 1 EC** Mary Seibel, B.Sc., Chair	**Simple Excipients EC** Eric Munson, Ph.D., Chair	**General Chapters–Dosage Forms EC** Martin Coffey, Ph.D., Chair	**Nomenclature & Labeling EC** Stephanie Crawford, Ph.D., M.P.H., Chair	**Botanical Dietary Supplements & Herbal Medicines EC** Robin Marles, Ph.D., Chair
Biologics Monographs 2–Proteins EC Tapan Das, Ph.D., Chair Pro Tem	**Small Molecules 2 EC** Justin Pennington, Ph.D., Chair	**Complex Excipients EC** Otilia Koo, Ph.D., Chair	**General Chapters–Chemical Analysis EC** Nancy Lewen, B.Sc., Chair	**Healthcare Safety & Quality EC** Melody Ryan, Pharm.D., M.P.H., Chair	**Non-Botanical Dietary Supplements EC** Raimar Löbenberg, Ph.D., Chair Pro Tem
Biologics Monographs 3–Complex Biologics & Vaccines EC Earl Zablackis, Ph.D., Chair	**Small Molecules 3 EC** Eric Kesslen, Ph.D., Chair	**Excipients Test Methods EC** Chris Moreton, Ph.D., Chair	**General Chapters–Microbiology EC** Mark Schweitzer, Ph.D., Chair	**Compounding EC** Brenda Jensen, M.A., Chair	**Dietary Supplements Admission Evaluation & Labeling EC** Amy Roe, Ph.D., Chair
Biologics Monographs 4–Antibiotics EC Matthew Borer, Ph.D., Chair	**Small Molecules 4 EC** Kim Huynh-Ba, M.S., Chair		**General Chapters–Packaging & Distribution EC** Renaud Janssen, Ph.D., Chair	**Healthcare Information & Technology EC** Jeanne Tuttle, B.S.Pharm., Chair	**Food Ingredients EC** Jonathan DeVries, Ph.D., Chair
Biologics Monographs 5–Advanced Therapies EC Mehrshid Alai, Ph.D., Chair	**Small Molecules 5 EC** Amy Jo Karren, B.Sc., Chair		**General Chapters–Measurement & Data Quality EC** Jane Weitzel, B.Sc., Chair		
	Over-the-Counter Methods & Approaches EC Raphael Ornaf, Ph.D., Chair		**General Chapters–Statistics EC** Charles Tan, Ph.D., Chair		
			General Chapters–Physical Analysis EC Kate Houck, Ph.D., Chair